The Role of Financial Intermediation in Economic Development: Evidence from Malaysia

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Declaration

Unless otherwise indicated this thesis is my own work

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Abstract

The role of financial intermediation in economic development has been a subject of considerable academic interest and intense policy debate. This study first develops an analytical framework to shed light on the mechanisms that link financial development and economic growth. The analytical framework is then applied to the Malaysian economy over the period 1960-2003 in order to examine how far financial development has progressed in the course of economic development, and whether it has been instrumental in promoting economic growth. A significant improvement in the Malaysian financial system alongside rapid economic growth, coupled with a rich history of financial sector reforms, make Malaysia an interesting case study for this subject.

This study adopts an in-depth case study approach to address the key issues in the financial development literature. It is motivated by the concern that the results from cross-country studies, while useful in detecting general empirical regularities for further analysis, are unable to capture and account for the complexity of the financial environments and economic histories of each individual country. Most previous time series studies on this subject have relied on the conventional OLS estimator, ignoring both the issues of endogeneity bias and omitted lagged variables bias. This study makes use of an unrestricted error-correction model to avoid omitted lagged variable bias, and employs an IV estimator to correct for endogeneity bias. Following a comprehensive survey of the policy context, institutional development and the role of financial sector in the growth process of the Malaysian economy since the 1960s, the core of the thesis focuses on analysing the determinants of financial development and the role of financial development in economic growth operating directly through private saving and private investment and indirectly through raising productivity. Each estimation equation is

formulated based on a theoretical model, augmented to take into account the relevant structural and institutional features of Malaysia.

The results suggest that financial development leads to higher output growth via promoting private saving and private investment. The findings also provide some support for the hypothesis of endogenous finance and growth models that financial development leads to higher economic growth through improved efficiency of investment. Repressionist financial policies, such as interest rate controls, high reserve requirements and directed credit programs, seem to have contributed positively to financial development. However, other government interventions in the economy, in particular resource reallocation through the operation of a broad-based employee provident fund (EPF) scheme and various public investment programs, seem to have impacted negatively on economic growth.

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LIST OF ABBREVIATIONS

2SLS	=	Two-stage least squares
ADB	=	Asian Development Bank
ADF	=	Augmented Dickey-Fuller test
AIC	=	Akaike's Information Criterion
AMLA	=	Anti-Money Laundering Act
ARDL	=	Autoregressive Distributed Lag
BIMB	=	Bank Islam Malaysia Berhad
BIS	=	Bank for International Settlements
BLR	=	Base lending rate
BNM	=	Bank Negara Malaysia
CDRC	=	Corporate Debt Restructuring Committee
CGCM	=	Credit Guarantee Corporation of Malaysia
CLOB	=	Central Limit Order Book
CMP	=	Capital Market Master Plan
COMMEX	=	Commodity and Monetary Exchange
CPI	=	Consumer price index
CUSUM	=	Cumulative sum
DGP	=	Data generation process
DOS	=	Department of Statistics Malaysia
ECM	=	Error-correction model
ECT	=	Error-correction term
EPF	=	Employee Provident Fund
FDI	=	Foreign direct investment
FKLI	=	Kuala Lumpur Stock Exchange Composite Index Futures
FSMP	=	Financial Sector Master Plan
GATS	=	General Agreement on Trade in Services
ICLIF	=	International Centre for Leadership in Finance
IDB	=	Islamic Development Bank
IFSB	=	Islamic Financial Services Board
IMF	=	International Monetary Fund
IOFC	=	Labuan International Offshore Financial Centre
IRA	=	Impulse response analysis
KLCE	=	Kuala Lumpur Commodity Exchange
KLOFFE	=	Kuala Lumpur Options and Financial futures Exchange
KLSE	=	Kuala Lumpur Stock Exchange
KPSS	=	Kwiatkowiski-Phillips-Schmidt-Shin test
LCM	=	Life-cycle model
LOFSA	=	Labuan Offshore Financial Services Authority
MGS	=	Malaysian Government Securities
MESDAQ	=	Malaysian Exchange of Securities Dealing and Automated Quotation
NCD	=	Negotiable Certificates of Deposit
NDP	=	National Development Policy
NEAC	=	National Economic Action Council
NEP	=	New Economic Policy
NVP	=	National Vision Policy
OTB	=	Overseas Trust Bank
OTS	=	Over-the-counter
PCA	=	Principal component analysis
PDS	=	Private debt securities

POSB	=	Post Office Savings Banks
PP	=	Phillips-Perron test
RAM	=	Rating Agency of Malaysia Berhad
SARs	=	Severe Acute Respiratory Syndrome
SBC	=	Schwarz's Information Criterion
SES	=	Stock Exchange of Singapore
SOCSO	=	Social Security Organization
TFP	=	Total Factor Productivity
UNCTAD	=	United Nations Conference on Trade and Development
VAR	=	Vector autoregressive
VECM	=	Vector error-correction model
WTO	=	World Trade Organization

CHAPTER 1: INTRODUCTION

1.1 Introduction

The financial system comprises banking institutions, financial markets, other financial intermediaries such as pension funds and insurance companies, and a large regulatory body - a central bank, which oversees and supervises the operations of these intermediaries. Every economy requires a sophisticated and efficient financial system to prosper. A more efficient financial system provides better financial services, and this enables an economy to increase its real GDP growth rate. Conversely, a weakened financial system spills over unfavourably into the economy. An inadequately supervised financial system may be crisis-prone, with potentially devastating effects. The important role of financial intermediaries and financial markets therefore merits more attention from researchers and policy makers.

Although economists attach different degrees of importance to financial development, its role in contributing to long-term growth can be theoretically postulated, and this has been increasingly supported by the findings of growth empirics. Due to the lack of sufficient time series data for developing countries, empirical research on this subject has been dominated by cross-country studies. These studies have consistently shown a positive relationship between financial development and economic growth. However, economists have not reached a consensus with regard to the direction of causality between these two variables, nor do they provide a satisfactory solution on the endogeneity of the variables used in their analyses. Furthermore, the results may vary considerably due to different institutional and structural characteristics of each economy. Given the above, the assertion that financial development contributes to output growth may be an unqualified assumption, and its validity has to be tested within specific cases. For that reason, more empirical case studies are needed to throw light on the issue.

This chapter proceeds as follows. Section 1.2 describes the purpose, scope, and contribution of this study. Section 1.3 explains the motivation behind why Malaysia is chosen as the case study for this subject. Section 1.4 provides the definition for the key financial terms used in this research. The last section provides an overview of the thesis structure.

1.2 Purpose and Contribution of This Study

This thesis seeks to provide some insight into how financial development and economic growth are related in the context of Malaysia. The central issue is how, and to what extent, improvement in Malaysia's financial system contributes to the process of economic development. It is hoped that this analysis will add to understanding of the evolutionary role of financial system, and the interacting mechanisms between financial development and economic growth.

The purpose of this thesis is three-fold. The first is to conduct a survey of both the theoretical and empirical evidence on this subject, and critically assess the evidence and validity of the theories. There is a vast literature on the issue of financial development and economic growth. Therefore, it is essential to identify studies that have made the greatest contribution to the understanding and development of this subject, and to try describing the relationship between each study. In doing so, the inadequacies and problems associated with the existing theories and empirical models will be identified, so that appropriate refinements can be introduced.

Secondly, based on a critical survey of the existing literature, this thesis aims to develop an analytical framework for examining the relationship between financial development and economic growth. A well-specified model that explains the mechanisms of how financial development is linked to economic growth (and vice versa) is essential in understanding the underlying transmission channels of the finance-growth nexus.

Thirdly, an in-depth case study for Malaysia will be conducted using this analytical framework to gain a deep insight into the role of financial intermediation in the process of economic development. There must be serious doubt about the validity of any inference drawn based on the results of cross-country studies, given that each country has its own unique institutional setting and economic history. For that reason, only one country is chosen here as a case study as opposed to the conventional broad comparative examination that involves a much larger sample.

This study contributes to the existing body of finance and development literature in several aspects. Firstly, it develops an analytical framework to provide an understanding of how financial development and economic growth are related by analysing the mechanisms linking them. Such a theoretical construct is often by-passed in many studies of this nature. Secondly, the literature on this subject has been dominated by cross-country studies. Notwithstanding the contributions of these studies, they offer little guide for policy formulation. This study adds to the existing body of

literature by providing further time series evidence on the issue and using this to help inform policy debates. Thirdly, this study adopts a multi-equation approach by taking into account the possibility of financial development being an endogenous variable, rather than treating it as an exogenous variable, as is usually done in most cross-country studies. This ameliorates the serious problems of misspecification bias, and adequately deals with simultaneity bias. Fourthly, despite its status as a leading developing country, the economy of Malaysia remains substantially under-researched. It is hoped that the results of this study will serve as a useful guide in policy making for countries in the same region or for other less developed countries.

Most of the available studies on the role of financial sectors in economic development in Malaysia are largely descriptive in nature (see, e.g., Drake, 1969; Lee, 1981; Rao, 1977). A more recent study by Yaakop (1988) employs a three-equation model to assess the impact of financial development on economic growth in Malaysia. However, the static regressions employed in his study fail to adequately explain the evolution of the economic behaviour of the key variables observed over time. With the advantage of using a longer time series, this study aims to disentangle the dynamics involved in the relationship between financial development and economic growth using recently developed time series econometric techniques.

1.3 Why Malaysia?

Malaysia provides an interesting case study of this subject for several reasons. With rapid economic growth following the industrial transformation that took place in the 1970s and 1980s, Malaysia has evolved in recent years to be a leading country in the developing world. Accompanying this development has been a significant improvement in its financial system. Financial development, in terms of the emergence of more financial institutions and financial instruments, has improved tremendously. However, little attention has been paid to understanding the evolutionary development process of Malaysia's financial system.

Malaysia has a rich history of financial sector reform. Various financial restructuring programs that aim to achieve a better financial system have been launched since the 1970s. However, there is little empirical evidence providing policy makers with the necessary information as to whether these reforms have had any impact on the financial system, and hence on economic growth. Such an interesting historical background provides the motivation behind using Malaysia as the case study for this subject.

The fact that Malaysia has a relatively good database by the standard of developing countries provides an added incentive for the research. The availability of a set of sufficiently long time series data allows for a meaningful time series investigation. This is critical given that economic growth is a long-run phenomenon, which necessitates analysing the evolution of the variables of interest over time in order to relate the findings to policy designs (Solow, 2001).

1.4 Definition of Key Financial Terms

Financial terms are sometimes inconsistently and ambiguously used in the literature.[1] It is therefore necessary to define the financial terms used in the context of this study. **Financial institution** refers to an individual member in the financial industry, such as the central bank, a commercial bank, or an insurance company (Tobin and Brainard, 1963). There are two broad categories of financial institutions: 1) banking institutions including commercial banks, finance companies, merchant banks, national savings banks, etc.; and 2) non-bank financial institutions, such as pension funds, insurance companies, etc. **Financial intermediary** refers to the entire industry of financial institutions. Thus, all commercial banks constitute one intermediary, all finance companies another, and so on. **Financial intermediation** is the process of transforming financial capital into more widely preferred types of financial assets by linking lenders and borrowers. **Financial markets** provide the exchange of capital and credit. They include stock markets, bond markets, money markets, future markets, foreign exchange markets, etc. **Financial instruments** refer to money, forwards, options, swaps, future contracts, etc.

A **financial system** comprises financial intermediaries, financial markets, and financial instruments. Asymmetric information and transaction costs lead to the creation of a financial system. The primary function of a financial system is to ensure the efficient allocation of resources in the presence of an uncertain environment. Most literature focuses on a specific aspect of financial system by considering only banks, stock markets or money. **Financial structure** refers to the composition of a financial system, such as banks, stock markets, provident funds, etc., that makes up the whole financial sector.

[1] For instance, De Gregorio and Guidotti (1995) argue that "financial development" and "financial intermediation" are often used interchangeably. This is a common source of confusion. Financial development is a broad term which includes all aspects of the development in the financial system whereas "financial intermediation" only refers to services provided by banks.

The extent of a financial system refers to how easy it is for firms and households to access financial services. The efficiency of a financial system refers to how effective financial markets and financial intermediaries are in reducing information and transaction costs for firms and households. **Financial deepening** is often referred to as the improvement in the extent or efficiency of a financial system. In the literature, a financial sector is said to deepen when: 1) the range of financial products and services broadens; 2) the accessibility to financial products and services improves; 3) the types of institutions operating in the financial sector expands; 4) the extent to which financial resources intermediated through the financial sector increases; 5) the amount of financial capital allocated to the private sector increases; and 6) the quality of regulation and stability of the financial sector is enhanced.

1.5 Organization of the Thesis

The rest of the thesis is organized as follows. Chapter 2 reviews the theoretical and empirical works on financial development and economic growth. While the theory was initiated in the 1950s, most of the empirical counterparts have only been developed from the 1990s, following the seminal work of King and Levine (1993a). However, the focus has been largely on assessing the cross-country evidence. The chapter highlights the drawbacks of these broad comparative analyses by providing evidence on sensitivity of the results, and argues in favour of a country in-depth case study.

Chapter 3 provides an overview of the Malaysian economy and development of its financial system in order to set the stage for the ensuing analyses. The policy context and growth experience of the Malaysian economy are discussed. Components of the Malaysian financial system are also described.

Data, variable construction, and econometric techniques are discussed in Chapter 4. The Autoregressive Distributed Lag (ARDL) bounds procedure is used as the cointegration test in favour of alternative tests given its desirable statistical features. An unrestricted error-correction model, which accounts for omitted lagged variable bias, is used to estimate the long-run relationships. An instrumental variable technique is adopted to correct for endogeneity bias so that reliable inference can be drawn from the estimated results.

Chapter 5 examines the determinants of financial deepening by taking real per capita GDP, real interest rates, and a set of financial sector policies into consideration. The technique of principal component analysis is used to construct a summary measure of financial sector policies in order to account for the joint influence of interest rate

controls, reserve and liquidity requirements, and directed credit programs imposed on the Malaysian financial system.

Chapters 6 and 7 then analyse the patterns and determinants of private saving and private investment in Malaysia, respectively. In the former, the analytical framework is constructed using the life cycle model with appropriate modifications to account for the structural and institutional features of the economy. In the latter, a static private investment function is derived from the neoclassical framework, with appropriate extensions to account for the features of the Malaysian economy. A cost minimization problem, which assumes firms optimize investment level with respect to a quadratic loss function, is adopted to obtain a dynamic investment model suitable for estimation.

Chapter 8 looks at the dynamic link between domestic saving and investment rates. The empirical specification of this dynamic relationship is derived based on an intertemporal current account model. Given that these two variables are cointegrated, the correlation is estimated using an error-correction model with a cointegrating framework to allow for an analysis of both the short-run and long-run dynamics of the saving-investment relationship.

The role of financial intermediation in the Malaysian economy is examined in Chapter 9. First, a growth accounting exercise is performed to shed light on the sources of growth by decomposing the growth rate of real GDP into TFP growth rate, and the growth rates of physical capital and labour input. The impact of financial development on economic growth, via the qualitative channel, is then tested using the standard neoclassical model, augmented with financial development.

The final chapter provides some concluding remarks. The results of the five empirical results from Chapters 5 to 9 are summarized and analysed in this concluding chapter.

CHAPTER 2: FINANCE AND DEVELOPMENT: A SURVEY OF LITERATURE

2.1 Introduction

This chapter provides a survey of the theoretical and empirical evidence on the relationship between financial development and economic growth to provide a setting for the ensuing analyses. The chapter is structured as follows: sections 2.2 and 2.3 explain the emergence and functions of financial systems, respectively. Section 2.4 describes the evolution of finance-growth thoughts. Section 2.5 surveys financial development and economic growth models. This is followed by a review of the empirical studies in section 2.6. The econometric techniques employed are critically appraised and some caveats on the interpretation of the results are highlighted. In section 2.7, some key issues which remain unresolved in the literature and require further research are discussed. The last section concludes.

2.2 The Emergence of Financial Markets and Intermediaries

Financial intermediaries emerge mainly due to information and transaction costs.[2] In an economy, some agents may have extra funds while some entrepreneurs may experience shortages of funds to finance investment projects. To raise the necessary funds in the absence of a sound financial system, entrepreneurs have to approach individual agents who have surplus funds to lend. Since the agents have very little knowledge about the investment projects involved, and the entrepreneurs have to find out which agents have surplus funds and how much each is willing to lend, this process turns out to be time consuming and costly.

In addition, when borrowers and lenders do not share common information, optimal financial contracts often involve agency costs, which are costs required in monitoring investment projects.[3] While borrowers typically possess inside information about the investment projects, they have little incentive to disclose such information. Efforts made by a third party to obtain additional information are often costly. Furthermore, since lenders cannot distinguish between honest and dishonest borrowers prior to issuing loans, the incorporation of a lemons premium into the market interest rate discourages honest borrowers. Given that the necessary information is not

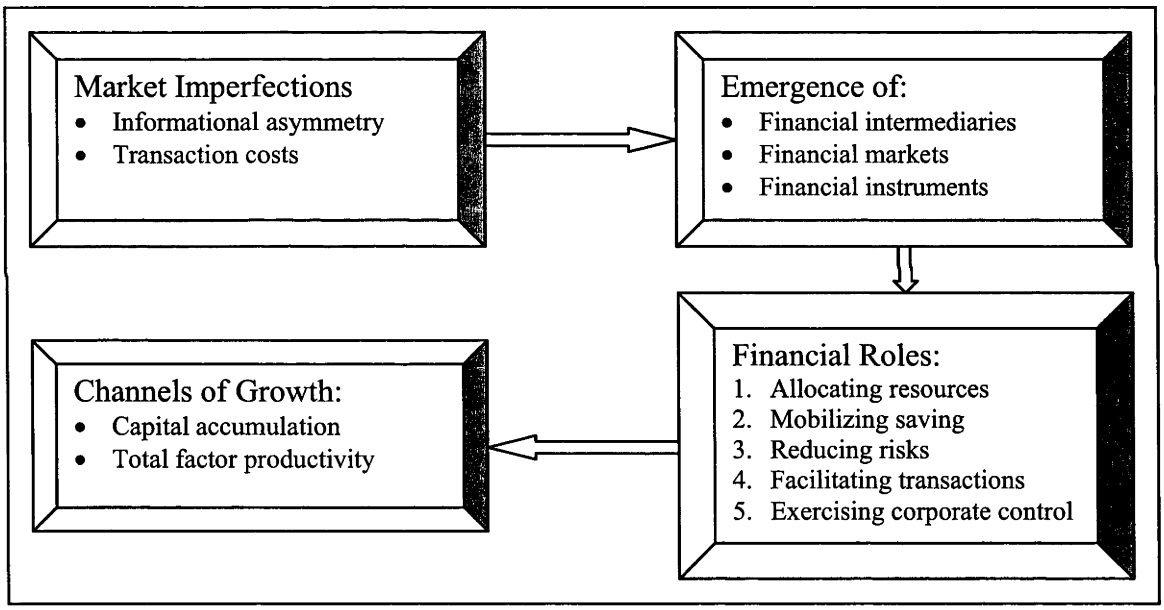
[2] See Leland and Pyle (1977), Stiglitz and Weiss (1981), Diamond (1984) and Boyd and Prescott (1986).

[3] See Williamson (1986) and Bernanke and Gertler (1989, 1990).

available, credit rationing by way of limiting loan size arises in the market (Jaffee and Russell, 1976). As such, without proper information transfer, credit markets will perform poorly as loans are given to "wrong" borrowers while genuine borrowers with good characteristics may sometimes be turned down.

Well-functioning financial markets and intermediaries ensure funds are allocated efficiently. Through economies of scale and economies of scope, financial markets and intermediaries are able to ameliorate the problems of asymmetric information and high transaction costs. The ability of financial markets and institutions to reduce these market frictions can lead to more efficient allocation of resources and thereby foster long-run growth.[4] Figure 2.1 summarizes how market imperfections are linked to long-run growth through the functions of financial systems, which are discussed in the next section.

Figure 2.1: A functional approach to financial systems



Source: Levine (1997).

2.3 The Functions of Financial Systems

Growth theories suggest that there are two distinct, and yet complementary channels through which financial development can influence growth - the capital accumulation channel and the total factor productivity (TFP) channel. The capital accumulation channel, often known as the quantitative channel, is developed based on

[4] See Diamond (1984), Boyd and Prescott (1986), Williamson (1986) and King and Levine (1993b).

the "debt-accumulation" hypothesis of Gurley and Shaw (1955). It focuses on the financial sector's ability to overcome indivisibilities through mobilizing saving. The mobilized saving is then channelled to productive sectors to fund investment projects, thereby leading to increased capital accumulation and higher output growth. The TFP channel, often known as the qualitative channel, emphasizes the role of innovative financial technologies in reducing informational asymmetries that hinder the efficient allocation of financial resources and the monitoring of investment projects.[5] An efficient financial system also facilitates the adoption of expensive new technologies.

These effects arise due to the key functions provided by the financial systems, which are fundamental in establishing the links between financial development and economic growth. In a comprehensive survey article, Levine (1997) classifies the functions of financial systems into the following five categories.

First, a well-functioning financial system leads to more efficient allocation of resources. Tobin and Brainard (1963) argue that with the ability to evaluate investment projects, financial intermediaries allow entrepreneurs to expand their business by borrowing at lower rates and with easier terms. Financial intermediaries evaluate different investment opportunities available by assessing the associated risks so that funds are channelled to the most promising projects. This leads to improved quality of investments that can have an expansionary effect on the economy. Financial markets may have a comparative advantage over financial intermediaries to fund new innovative investment projects since market participants can acquire relevant information on firms quickly, leading to more efficient allocation of resources.

Second, financial intermediaries and financial markets perform an important role in coordinating the saving and investment decisions of households and firms, respectively (Wicksell, 1935). Savings from households may be insufficient to fully fund a borrower. Financial systems induce mobilization of saving by pooling the savings of diverse households and making this aggregate fund available for lending. Hence, as financial systems expand, more deposits will be attracted from savers, and more funds will be available for investments. This facilitates financial intermediating activities, and hence deepens the financial systems.

Third, efficient financial systems allow investors to diversify their portfolios and hedge against risks. With the advantage of a large number of borrowers and lenders, financial intermediaries can effectively provide liquidity by properly matching the different maturity periods of loans (Diamond and Dybvig, 1983). Emergence of

[5] See Townsend (1979), Greenwood and Jovanovic (1990) and King and Levine (1993b).

financial intermediaries significantly ameliorates the liquidity risks faced by individuals, and therefore facilitates investment activities. As a result, unnecessary liquidations can be avoided (Bencivenga and Smith, 1991). Financial markets also provide ample liquidity. Many potentially lucrative investment projects require long term commitment of capital, but investors are often reluctant to tie up their savings. Financial markets, particularly stock markets, offer a solution by allowing investors to invest in these high-return projects and yet be able to sell the investment quickly and obtain cash when necessary. This makes stock markets attractive avenues for some investors.

Fourth, transactions are facilitated through offering credit facilities and guaranteeing payments. Gurley and Shaw (1960) argue that the main function of financial intermediaries is to transform primary securities into indirect securities. Financial intermediaries can obtain profits during the course of this transformation by exploiting economies of scale in lending and borrowing. Since financial intermediaries can manage and invest funds at a much lower cost, small individual depositors can avoid the hassles of having to evaluate every potential borrower and firms seeking to borrow can save significant time and efforts to search for funds. This therefore reduces the costs of information and therefore greatly facilitates transactions.

Fifth, costs related to monitoring firms may fall with the increased availability of services provided by financial intermediaries. If it is costly for outside investors to verify project returns, firms will be discouraged from borrowing more, given that more borrowing implies a greater risk of default. Hence, these verification costs may impede efficient investment (Bernanke and Gertler, 1989). With the existence of financial intermediaries, Diamond (1984) shows that monitoring costs will be reduced through proper financial arrangements. From the financial market perspective, the valuation of company assets based on stock prices provides a yardstick to measure managers' performance. This leads to improved corporate controls, and may exert a positive influence on economic growth.

2.4 The Evolution of the Thinking on Finance and Growth

Economists hold different perspectives on the links between financial development and economic growth. The important role of credit markets in the process of economic development can be traced back to Schumpeter (1911), who contends that entrepreneurs require credit in order to finance the adoption of new production techniques. Banks are viewed as key agents in facilitating these financial intermediating

activities and promoting economic development. Hence, well-developed financial systems can channel financial resources to the most productive use. The alternative explanation initiated by Robinson (1952) suggests that financial development does not lead to higher economic growth. Instead, financial development responds passively to economic growth as a result of higher demand for financial services. When an economy expands, households and firms demand more financial services. In response to this increased demand, more financial institutions, financial products and services emerge, thereby leading to an expansion in the financial systems.

The notable early works on finance and development along the Schumpeterian lines include Gurley and Shaw (1955), Goldsmith (1969) and Hicks (1969). They argue that development of a financial system is crucially important in stimulating economic growth. Under-developed financial systems retard economic growth. The policy implication of this view points to the importance of formulating policies aimed at expanding the financial systems in order to foster growth. The creation of more financial institutions and the provision of a greater variety of financial products and services generate a positive effect on the saving-investment process, and hence on economic growth. This was dubbed the "financial structuralist view". However, this view had little impact on development policy making in the early post-war decades, partly because it was not presented in a "formal" manner, and partly because of the dominant influence of the Keynesian "financial repressionist" ideology. Financial repression refers to various restrictive measures imposed on the financial systems, including interest rate controls, high reserve requirements, and directed credit programs. These distortionary policies were popular in developing countries as ways to finance fiscal deficits without increasing tax or inflation. However, these measures weaken the incentive to hold money and other financial assets, and therefore reduce the credit available for investors. Hence, financial repression curtails the size of the banking system and suppresses financial intermediation.

In the 1970s, the applicability of the Keynesian view to analysing the role of financial intermediaries and financial markets in the development process was cogently challenged by McKinnon (1973) and Shaw (1973). The McKinnon model, which was further developed and popularized by its followers (i.e., Fry, 1988; Kapur, 1976; Mathieson, 1980; Pagano, 1993), assumes that investment in a typical developing economy is mostly self-financed. Given its lumpy nature, investment cannot materialize unless sufficient saving is accumulated in the form of bank deposits. Such a complementary role between money and physical capital is termed the

"complementarity hypothesis". On the other hand, the "debt-intermediation" view presented by Shaw (1973) postulates that financial intermediaries promote investment and raise output growth through borrowing and lending. These two arguments suggest that a higher level of financial development, which can be the result of financial liberalization, will lead to increased output growth.

Building upon the early works of Gurley and Shaw (1955),[6] Goldsmith (1969), Hicks (1969) and others, McKinnon (1973) and Shaw (1973) challenge the financial repression paradigm and provide a new paradigm in the design of financial policies. Their theories suggest that distortions in the financial systems, such as loans issued at an artificially low interest rate, directed credit programs, and high reserve requirements are both unwise and unnecessary.[7] These can reduce saving, retard capital accumulation, and prevent efficient resource allocation. By allowing interest rates to adjust freely according to market mechanisms, entrepreneurs have more incentives to invest in high-yield projects. As such, higher economic growth is expected. Therefore, they called for financial liberalization, which refers to the process of eliminating or significantly alleviating financial system distortions. This was dubbed the "financial liberalization view".

In the early 1980s, the McKinnon-Shaw school of thought was severely criticized by a group of neo-structural economists led by van Wijnbergen (1982, 1983), Taylor (1983) and Buffie (1984). Several key assumptions, which differed from the McKinnon-Shaw framework, were introduced. The most distinctive feature in their models of developing economies is the focus on competitive and efficient "curb markets", or non-institution credit markets. Since commercial banks are subject to reserve requirements, which involve a leakage in the intermediation process, the neo-structuralists argue that curb markets perform more efficiently in intermediating savers and investors. Their models assume that households own three types of assets: gold, bank deposits, and curb market loans, which are substitutes for each other. A rise in the bank deposit rates induces households to substitute curb market loans for bank deposits, resulting in a fall in the supply of loanable funds. This discourages investment and

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[6] In Gurley and Shaw's (1955) model, financial capacity (defined as borrowers' ability to absorb debt without reducing current consumption) is the key determinant of aggregate demand. Financial intermediaries extend households' financial capacity by facilitating lending and borrowing activities.

[7] Both McKinnon (1973) and Shaw (1973) argue that financial repression policies are largely accountable for the poor economic performance of developing countries in the 1960s, where low saving, low investment and credit rationing were prevalent. Investment suffered both in terms of quantity and quality as funds were allocated at the discretion of policy makers instead of following the marginal productivity of each investment project. Financial liberalization, in terms of removal of all financial repression policies (e.g., interest rate ceiling, directed credit programs, and high reserve requirements) is therefore advocated.

dampens output. Therefore, the neo-structuralists claim that financial liberalization is unlikely to raise growth in the presence of efficient curb markets.

However, as Fry (1988) argues, curb markets are not necessarily as competitive and efficient as commercial banks. If this were the case, the neo-structuralists' claim that financial liberalization is likely to reduce economic growth by lowering credit supply may not hold. Furthermore, Owen and Solis-Fallas (1989) show that the relative efficiency of intermediation in formal and informal credit markets significantly influences the outcome of portfolio allocation effects generated through higher bank deposit rates. They contend that the characterization of unorganized credit markets as a perfectly efficient intermediation system by the neo-structuralists is highly unrealistic.

With the evolution in the growth literature in the 1980s, more complex types of models incorporating financial institutions into endogenous growth models emerged in the early 1990s.[8] Various techniques, such as externalities and quality ladders, were employed to model financial intermediation explicitly rather than taking it for granted as in the McKinnon-Shaw framework. These models support the finance-led argument by demonstrating that financial development reduces informational frictions and improves resource allocation efficiency. The policy implication of these views is that the abolition of government restrictions should foster real sector growth in developing countries.

The McKinnon-Shaw framework emphasizes the importance of financial liberalization in increasing saving and, hence, investment, whereas most endogenous finance and growth models focus on the role of financial intermediation in improving efficiency (rather than amount) of investment. Hence, their main distinction lies in the different focus of investment, i.e., quality versus quantity. Besides, unlike the McKinnon-Shaw models, which highlight the role of financial development in the process of economic growth, the endogenous finance and growth models show reciprocal interactions between these two variables. That is, on the one hand, a higher level of economic development stimulates more demand for financial services, leading to increased competition and efficiency in the financial intermediaries and financial markets. On the other hand, the provision of timely and valuable information by financial intermediaries to investors allows investment projects to be launched more efficiently, and this enhances capital accumulation and economic growth.

[8] See, e.g., Greenwood and Jovanovic (1990), Bencivenga and Smith (1991, 1993), Saint-Paul (1992), King and Levine (1993b), Pagano (1993), Bencivenga, Smith and Starr (1995), Greenwood and Smith (1997) and Blackburn and Hung (1998) for detailed expositions.

As an important extension to the existing body of knowledge, some studies have focused on the relative merits of a bank-based ("German-Japanese") financial system and a market-based ("Anglo-Saxon") financial system in promoting economic growth.[9] Although banks continue to play an important role in allocating resources to fuel economic growth, the increased importance of financial markets is widely observed especially in more advanced economies. A bank-based financial system typically has relatively less developed financial markets. The main feature of this system is that firms rely more on finance provided by banks rather than on financial markets. As such, banks are more closely involved with firms where they can exercise a monitoring role. Firms are usually owned by a small number of shareholders with large share stakes and so hostile takeovers are also less likely to be seen in a bank-based system. This system tends to promote long-term growth as banks tend to offer longer term loans. In contrast, a market-based financial system (such as the UK and the US), is characterized by the presence of highly developed financial markets. Banks are less involved in the allocation of funds or ownership of financial assets, and long-term funds are usually raised through financial markets which are active, liquid and efficient. Firms are owned by a large number of shareholders with relatively small share stakes. Hence, mergers and takeovers are widely observed. A market-based financial system is more likely to have short-term effects as firms are primarily concerned with their immediate performance.

The model developed by Boyd and Smith (1998) shows that credit and equity markets function as complements rather than substitutes.[10] As Merton and Bodie (2004) argue, the issue is overall financial development and not which type of financial structure provides the financial services required to fuel growth. Given their diverse roles, it is possible for financial intermediaries and financial markets to have mutually reinforcing roles in the overall development of financial systems and economic growth.

2.5 Models of Financial Development and Economic Growth

This section provides an overview on different models of financial development and economic growth.

[9] See Allen and Gale (1999, 2000), Beck and Levine (2002), Ergungor (2004) and Levine (2005) for comprehensive discussions on the relative merits for each type of financial system.

[10] See also Levine and Zervos (1998) and Blackburn, Bose and Capasso (2005).

2.5.1 Keynesian model

According to Keynes (1936), individuals hold money for three reasons: transactions, precautionary and speculative motives. The speculative demand for money arises from decisions about choosing between holding money and holding bonds. Bonds always yield the market interest rate (i). When the interest rate is low, individuals have more incentives to hold speculative money balances. In Keynes' model, there are some interest rates that individuals consider as "normal" at a particular point in time. When the interest rates fall below their normal level, all individuals form the same expectation that the interest rate will rise in future. Hence, a rise in money supply will have no effect on interest rates since no one would want to purchase more bonds. This phenomenon is known as the "liquidity trap", which has a crucial implication for the equilibrium level of output. Summing up, the money demand function can be expressed as:

$$(M/P)^D = \alpha + \beta/(i - \tilde{i}),\ \alpha > 0,\ \beta > 0 \qquad (1)$$

where i is the market interest rate, $\tilde{i}$ is the liquidity trap interest rate, and $i > \tilde{i}$. Hence, market interest rate is inversely related to the demand for real balances.

In this simple Keynesian model, planned investment is solely determined by the real interest rates. When the real interest rates increase, planned investment will be lower than planned saving at the full employment level in the presence of a liquidity trap, resulting in unintended inventory accumulation. Aggregate output must fall to restore equilibrium. Therefore, the Keynesian framework implies a high interest rate is not conducive for growth. However, the Keynesian model is criticized for its assumption on price rigidity and short-term orientation.

2.5.2 Neoclassical model

The neoclassical model assumes that capital markets operate costlessly and perfectly. Notwithstanding money has a role to satisfy the transactions motive, it has no direct role to play in capital accumulation. As such, it is not important to distinguish between currency and deposits, as money in this case can be considered as the outside fiat money. The key idea of the neoclassical model can be summarized as:

$$(M/P)^D = f(Y, R_{CAPITAL}, R_{MONEY}) \ ;\ f_Y > 0, f_{R_{CAPITAL}} < 0, f_{R_{MONEY}} > 0 \qquad (2)$$

where $(M/P)^D$ is the real money demand, Y is the real income, $R_{CAPITAL}$ is the real rate of return on capital, and R_{MONEY} is the real return on money. Y is positively related to $(M/P)^D$ due to the transactions motive demand for money. The main assumption of

this model is that money and capital are substitutes. Hence, an increase in R_{MONEY} reduces demand for physical capital. In other words, holding large real cash balances will prevent the accumulation of capital. This implies that $R_{CAPITAL}$ is negatively associated with $(M/P)^D$ whereas R_{MONEY} is positively associated with $(M/P)^D$.

2.5.3 The McKinnon-Shaw model

The two financial liberalization models developed by McKinnon (1973) and Shaw (1973) emphasize different aspects of the effects of raising interest rates. McKinnon's model stresses the relationship between the deposit rate and investment whereas Shaw's model focuses on the importance of lending and borrowing activities. The main difference between these two models lies in the assumption about the way finance is raised. In McKinnon's outside money model, all finance is raised internally whereas Shaw (1973) postulates an inside money model that considers externally raised funds.[11] For practical considerations, most projects are financed by a combination of own funds (outside money) and borrowed funds (inside money). Therefore, these two models should be viewed as complementary (Molho, 1986).

The McKinnon-Shaw model has strong implications for financial development, which can begin by allowing the real interest rates to free flow according to market mechanisms. However, it is criticized on the ground that the use of interest rate as a key indicator of financial development is unconvincing. As De Gregorio and Guidotti (1995) put forward, this is misleading since high interest rates may reflect a lack of confidence in economic policy and the banking system, and the adoption of more risky behaviour in investment undertakings.

McKinnon (1973) criticizes both the Keynesian and neoclassical models for assuming that capital markets function competitively with a single rate of interest governing the markets. These views cannot adequately explain the operation of capital markets in poor countries, which are often characterized by fragmented rates of interest. The complementarity hypothesis of McKinnon (1973) states that money and capital are complements in developing countries in the absence of efficient financial systems. The hypothesis is derived from an outside money model where it is assumed all economic units are confined to self-finance and money is essentially the fiat currency issued by

[11] Outside money refers to money held outside the monetary base, e.g., gold or cash. In contrast, inside money refers to any debt that is used as money.

the public sector. Because of fragmented economic conditions and the lack of external finance to firms, physical capital has a lumpy nature. Entrepreneurs must accumulate sufficient funds in monetary assets to finance investment projects. As such, money and capital are viewed as complementary assets where money serves as a channel through which capital accumulation takes place.

Using the complementarity hypothesis as the basis, McKinnon (1973) develops an alternative monetary model that can better explain the relationship between the monetary process and capital accumulation in less developed economies. The complementarity hypothesis is a joint hypothesis where the demand for real money balances, $(M/P)^D$, depends positively on the real average return on capital ($R_{CAPITAL}$), and the investment ratio (I/Y) rises with the real deposit rate of interest (R_{MONEY}). This joint hypothesis implies that both $(M/P)^D$ and I/Y react positively to a rise in $R_{CAPITAL}$ and R_{MONEY}, which can be summarized as:

$$(M/P)^D = f(Y, R_{CAPITAL}, R_{MONEY}) \quad ; \quad f_Y > 0, f_{R_{CAPITAL}} > 0, f_{R_{MONEY}} > 0 \tag{3}$$

and

$$I/Y = g(R_{CAPITAL}, R_{MONEY}) \quad ; \quad g_{R_{CAPITAL}} > 0, g_{R_{MONEY}} > 0 \tag{4}$$

The debt-intermediation view of Shaw (1973) is based on an inside money model, where money created as loans to the private sector is based on the internal debt of the private sector. The higher the money stock in relation to economic activity, the greater the extent of financial intermediation between savers and investors through the financial systems. Shaw (1973) argues that high interest rates are essential in attracting more saving. With more supply of credit, financial intermediaries may promote investment and raise output growth through borrowing and lending. Shaw (1973) stresses the importance of raising funds externally where money plays the role of credit and tangible medium of exchange. Complementarity has no role to play here as investors are not constrained to self-finance. If institutional credit is not available, non-institutional credit will appear. This model can be summarized as:

$$(M/P)^D = f(Y, R_{OPP}, R_{MONEY}, T) \quad ; \quad f_Y > 0, f_{R_{OPP}} < 0, f_{R_{MONEY}} > 0, f_T > 0 \tag{5}$$

where Y is real income, R_{OPP} is a vector of opportunity costs of holding money in real terms, R_{MONEY} is the real deposit rate of interest, and T is the technological improvement in the financial industry. Technological advancement is assumed to have a positive impact on money demand.

2.5.4 Endogenous finance and growth models

In the neoclassical growth model, production in an economy depends on the amount of capital stock and labour, and the level of technological progress. Assuming that there is no technological progress and the labour force grows at a constant rate, per capita production depends only on per capita capital stock. The law of diminishing marginal returns results in less and less output produced as per capita capital stock increases. As such, higher capital accumulation due to higher saving can only have a temporary impact on growth. Achieving long-run growth requires continuous technological progress. This consideration leads to the emergence of endogenous growth models following the seminal work of Lucas (1988).

As highlighted previously, development in the financial systems can lead to higher economic growth through technological progress, given that expansion in the financial systems allows more innovative projects to be carried out. However, long-term growth is only possible with continuous technological development. Since technological progress is treated as an exogenous factor, financial development cannot be a determinant of long-run growth in the neoclassical framework. The endogenous growth models are models in which long-run growth is an endogenous variable. These models provide a theoretical framework, demonstrating that financial intermediation can have both growth and level effects.

For an illustration, consider the model developed by Pagano (1993) to highlight the relevance of financial factors in the process of economic growth. Pagano assumes the simplest endogenous growth setting, i.e., the *AK* model of Rebelo (1991). It is postulated that only capital (K_t) is used in production, and it exhibits constant returns to scale. Capital depreciates at a rate of δ and there is no population growth so that $K_{t+1} = I_t + (1-\delta)K_t$. It is also assumed that a certain proportion of saving, the size of $(1-\phi)$, is lost during the process of financial intermediation. Only the fraction (ϕ) of total saving can be used to finance investment. Such a saving leakage indicates inefficiency in the financial systems. Therefore, the saving-investment relationship can be described as $I_t = \phi S_t$, and the steady state growth rate (g) expressed as:

$$g = \frac{K_{t+1} - K_t}{K_t} = \frac{I_t + (1-\delta)K_t - K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta = A\phi s_t - \delta \qquad (6)$$

where $s_t = S_t / Y_t = S_t / AK_t$. From the above, it can be seen that there are three ways in which finance can influence growth: 1) increasing the marginal productivity of capital (A); 2) raising the proportion of saving channelled to investments (ϕ); and 3)

influencing saving rates (s). The rate of depreciation (δ) is assumed to be constant. The two limitations of this model are that this is a closed economy model, which does not account for capital inflows, and the model is restricted to financial intermediation activities while ignoring stock markets activities and other components in the financial system.

2.6 Empirical Evidence

Building upon the early works of Schumpeter (1911), Gurley and Shaw (1955), Patrick (1966), Goldsmith (1969), McKinnon (1973), Shaw (1973) and others, there has been a number of empirical studies focusing on examining the relationship between financial development and economic growth using data for various countries and time periods. Although most of these studies document a positive association between financial development and economic growth, this does not necessarily imply that financial development is always exogenous to economic growth (Levine, 1997). The empirical results nonetheless have a far-reaching influence on the policy prescriptions adopted by many developing countries during the 1970s and 1980s, which tended to encourage more financial saving by increasing real interest rates.

The empirics on this subject can be broadly categorized into cross-country studies and time series studies. Cross-country analyses typically use growth equations in the style of Barro (1991), while time series analyses mainly adopt either a vector autoregressive (VAR) framework or a single equation error-correction framework. Both types of study are subject to several limitations. The summary findings of the cross-country and time series studies are presented in Tables 2.1 and 2.2, respectively.[12]

2.6.1 Cross-country evidence

Empirical studies on this subject burgeoned in the 1990s, following the prominent work of King and Levine (1993a). They study 80 countries over the period 1960-89 by controlling for other factors that affect long-run growth. Their results imply that the initial level of financial development is a good predictor of the subsequent rates of economic growth. Their empirical specifications, especially the measures of financial development, have been widely used with some modifications in many recent studies. However, their study was criticized for the use of a static regression framework which omits dynamics. Attempting to account for the time dimension by using dynamic panel

[12] See also Levine (2006) for an extensive review of the recent empirical literature on finance and growth.

estimation techniques, the results of Levine (1999), Beck, Levine and Loayza (2000), Benhabib and Spiegel (2000), Levine, Loayza and Beck (2000), Rousseau and Wachtel (2000), Beck and Levine (2004) and Rioja and Valev (2004) point to the same conclusion that the measures of financial development have a positive impact on economic growth. Quite apart from the general findings of the literature, Ram (1999) finds that financial development and economic growth are negatively correlated based on the results of 95 countries. Similar findings are obtained by De Gregorio and Guidotti (1995) for 12 Latin American countries.

While King and Levine (1993a) focus on using banking variables to proxy the level of financial development, some studies attempt to examine the role of stock markets in promoting economic growth. Using dynamic panel techniques, Beck and Levine (2002) show that stock markets seem to promote growth after controlling for country-specific effects and endogeneity biases. These results support the earlier findings of Atje and Jovanovic (1993), Demirguc-Kunt and Maksimovic (1998), Levine and Zervos (1998) and Henry (2000).

Some attempts have been made to examine the issue at the micro level by exploiting firm- or industry-level data, supplementing the findings of these cross-country studies. Rajan and Zingales (1998) contend that better-developed financial intermediaries and financial markets help reduce market frictions. This provides lower costs of external finance to facilitate firms' expansion and encourage new firm formation. Using industry-level data for a large sample of countries over the 1980s, they demonstrate that those industries which are more reliant on external finance prosper more in countries with better-developed financial intermediaries and financial markets. The results suggest that financial development may play a beneficial role in firms' growth and the rise of new firms by easing the flow of external finance. The seminal work of Rajan and Zingales (1998) has stimulated much research interest in using micro level data to gain more insight into the relationship between financial development and economic growth beyond country-level.[13]

There is also considerable interest in examining the relative importance of a bank-based or market-based financial system in economic growth. The cross-country results presented by Ndikumana (2000) and Levine (2002) indicate that although there is a strong connection between financial development and economic growth, there is no overall empirical support for either the bank-based or market-based view. Using

[13] See, e.g., Wurgler (2000), Cetorelli and Gambera (2001), Demirguc-Kunt and Maksimovic (2002), Fisman and Love (2003), Bertrand, Schoar and Thesmar (2004) and Allen, Qian and Qian (2005).

industry-level data, Beck and Levine (2002) obtain the same conclusion that differences in financial systems *per se* do not explain the growth variation of financial dependent industries across countries. By exploiting firm-level data for 40 countries, Demirguc-Kunt and Maksimovic (2002) show that overall financial development helps explain the growth of firms; however, firms do not tend to grow faster in either bank-based or market-based systems.

Table 2.1: Cross-country evidence on finance and growth: a summary

Study	Sample	Method	Key findings
Goldsmith (1969)	Annual data for 35 countries over the period 1949 to 1963.	Ordinary least squares (OLS) and graphical analysis	The regression results show a clear relationship between financial development and economic growth. However, the relationship is statistically weak in the sense that the correlation coefficients are low and negative for developed countries.
Atje and Jovanovic (1993)	Annual observations for 94 countries during the period 1960-85.	OLS	Stock markets have both positive levels and growth effects on economic activity. However, a similar effect of bank lending is not observed.
King and Levine (1993a)	Annual data for 80 countries over the period 1960 to 1989.	OLS	Various indicators of financial development are found to be positively and strongly associated with real per capital GDP growth, the rate of physical capital accumulation, and TFP growth. The empirical results provide support for the Schumpeterian view that finance matters for growth.
De Gregorio and Guidotti (1995)	Annual data for 99 countries during 1960-85, and panel data for 12 Latin American countries during 1950-85.	OLS and panel data random effects	The empirical findings suggest that financial development leads to improved economic performance. However, for the case of Latin American countries, unregulated financial liberalization and expectation of government bail out can lead to negative effects of finance on growth.
Odedokun (1996)	Annual data for 71 less developed countries, spanning the 1960s to 1980s.	Generalized least squares (GLS)	Regression results for each country show that financial development promotes economic growth in about 85% of the sample countries. The growth-enhancing effects of finance are more prominent in low-income than in high-income less developed countries. The panel data estimation shows that the results are invariant across regions and the levels of economic development.
Harris (1997)	Annual data for 39 countries over the period 1980-88.	Two stage least squares (2SLS)	In contrast to the results reported by Atje and Jovanovic (1993), the paper finds little support for the argument that stock market activity helps explain growth in per capita output. For less developed countries, the stock market effect is rather weak. However, stock market activity is found to have some effect on growth in developed countries.

Study	Sample	Method	Key findings
Demirguc-Kunt and Maksimovic (1998)	Annual data for 30 developing and developed countries for the period 1980-91.	OLS	The analysis shows that in countries with better and more efficient legal systems, more firms use long-term external finance. A larger banking sector, a more active stock market, and a well-developed legal system enable firms to obtain external funds more easily, which in turns facilitate firms' growth. These firms typically report lower returns on capital and profits. Government subsidies do not appear to play a role in these economies.
Levine (1998)	Annual data for 42 countries covering the period 1976-93.	OLS and Generalized method of moments (GMM)	Countries with more efficient legal systems tend to have better developed banking systems. Banking sector development contributes positively to per capita GDP growth.
Levine and Zervos (1998)	Annual data for 47 countries over the period 1976-93.	OLS	The results are consistent with the view that financial development leads to higher economic growth. Stock market liquidity and banking sector development both positively affect real per capita GDP growth, capital accumulation, and productivity growth. Stock market size, volatility, and international integration are robustly related to growth.
Rajan and Zingales (1998)	41 countries with industry-level data for the period 1980-90.	Panel data fixed effects	The results indicate that those industries which are more reliant on external finance prosper more in countries with better-developed financial intermediaries and financial markets. Financial development may play a beneficial role in firms' growth and the rise of new firms by easing the flow of external finance.
Levine (1999)	Annual data for 49 countries over the period 1960-89.	GMM	The results show that financial systems are better developed in countries with sound legal and regulatory systems. Furthermore, financial development is found to be positively associated with economic growth.
Ram (1999)	Annual data for 95 countries over the period 1960-89.	OLS	Based on the data for 95 individual countries, the correlation between financial development and economic growth is found to be weakly negative or negligible. Similar patterns are observed when regression analyses are performed on each individual country, and on each sample grouped according to the level of growth rates.
Beck, Levine and Loayza (2000)	Annual data for 77 countries for the period 1960 to 1995.	Instrumental variable (IV) and GMM	Financial sector development is found to be robustly and positively correlated with both real per capita GDP growth and TFP growth. The results also provide some support for the positive role of financial development on both capital accumulation and private saving rate; but these links are statistically weaker.
Benhabib and Spiegel (2000)	Annual observations for Argentina, Chile, Indonesia, and Korea from 1965 to 1985.	GMM	The results show that financial development positively affects both investment rates and TFP growth. However, the results are sensitive to the inclusion of country fixed effects and different indicators of financial development.

Study	Sample	Method	Key findings
Henry (2000)	Annual data for 11 developing countries (Argentina, Brazil, Chile, Colombia, India, Korea, Malaysia, Mexico, the Philippines, Thailand and Venezuela), spanning the 1970s and 1990s.	Panel data techniques	The empirical evidence shows that stock market liberalization leads to increased private investment in 9 out of 11 countries studied. The average growth rate of private investment was 22 percentage points higher than the sample mean three years after the liberalization.
Levine, Loayza and Beck (2000)	Annual data for 74 countries spanning from 1960 to 1995.	IV and GMM	Using both instrumental variable and dynamic panel techniques, the results show that financial intermediary development is positively related to economic growth. The results also suggest that legal systems and accounting standards help explain differences in the level of financial development.
Beck and Levine (2002)	Annual data from 1980 to 1990 on a panel of 42 countries and 36 manufacturing industries.	OLS and panel data techniques	Industries that rely more on external finance tend to grow faster in countries with more advanced financial systems and more efficient legal systems. However, having a bank-based or market-based financial system *per se* does not seem to matter for growth.
Deidda and Fattouh (2002)	Annual data for 80 countries over the period 1960-89.	Threshold OLS model	Using initial per capita income as the threshold variable, the authors find that higher levels of financial development are positively related to higher growth rates. In the model without threshold effects, the results only hold for high-income countries but not for low-income countries.
Demirguc-Kunt and Maksimovic (2002)	Firm level data for the largest publicly traded manufacturing firms in 40 countries over the period 1989-96.	2SLS	The impact of the stock market and banking sector development on firms' growth is closely related to the level of development of the country's legal environment. There is no evidence that development of a market-based or bank-based financial system *per se* affects firms' access to financing.
Levine (2002)	Annual data for 48 countries over the period 1980-95.	OLS and IV	The results provide no evidence for either the bank-based or market-based view. The overall level of financial development helps explain cross-country growth variations. The legal system is an important factor which influences financial development, and this in turns influences long-run economic growth.
Rousseau and Wachtel (2002)	Annual data for 84 countries from 1960 to 1995.	Panel data fixed effects	The results show that there is an inflation threshold of 13-25% for the finance-growth link. Finance does not seem to increase growth when inflation exceeds this threshold level. The effects are significantly positive when inflation falls below the threshold of 6-8%.

Study	Sample	Method	Key findings
Beck and Levine (2004)	A panel data set on 40 countries over the period 1976-98.	OLS and GMM	Overall financial development contributes positively to economic growth. Both stock market and banking sector development enter the growth regressions significantly and positively, suggesting that stock markets provide financial services different from that of banks.
Rioja and Valev (2004)	Panel data from 74 countries for the period 1961-95.	GMM	By dividing all countries into three groups according to their levels of financial development, the evidence suggests that finance has a strong positive impact on economic growth mainly in countries with more developed financial systems. In financially less developed countries, the effect of finance on growth is ambiguous.
McCaig and Stengos (2005)	Annual data for 71 countries from 1960 to 1995.	GMM	The results indicate a strong positive effect of finance on growth when private domestic credit or liquid liabilities is used as the measure of financial development. However, the link is considerably weaker when the ratio of commercial bank assets to central bank assets is used as the indicator of financial development.
Ndikumana (2005)	Annual data for 99 countries for the period 1965-97.	OLS and panel data fixed effects	The evidence shows that various financial development indicators are positively related to domestic investment, suggesting that as financial systems grow, capital becomes more easily available and cheaper, which is conducive to capital accumulation. On the other hand, the results find no support for either a bank-based or market-based financial system is better at promoting investment. Hence, financial structure does not seem to matter.

On the whole, the results of these cross-country studies seem to suggest that financial development exerts a positive impact on economic growth. Although these studies have made significant contributions to the literature for understanding the finance-growth nexus, the results are subject to the several criticisms outlined below.

2.6.2 Limitations of cross-country studies

While many empirical studies have tried to investigate the link between financial development and economic growth, the standards of the econometric techniques employed are often subject to criticisms.[14] Pure cross-country regressions typically construct observations for each country by averaging out the variables over the entire period of study. The empirical specification is often adopted from Barro's (1991)

[14] For more discussion on the methodological problems associated with the growth regression studies, see Levine and Renelt (1992), Mankiw (1995), Clark (1997), Temple (1999, 2000) and Ericsson, Irons and Tryon (2001).

regression model, augmented with financial development indicators. However, there are several econometric problems associated with this specification.

Most studies take the finance-leading view for granted and so focus explicitly on how the financial system affects growth, while little effort has been given to examining the reverse. As a result, these studies typically employ a single equation approach in specifying the finance-growth relationship. While such an empirical specification is intuitively appealing for its simplicity, its use may pose serious conceptual problems. Since potential endogeneity has not been properly controlled for, this is likely to yield biased and inconsistent estimators.

Researchers often include instrumental variables in the estimation to deal with the problems of endogeneity bias. However, as demonstrated by Ahmed (1998) and Ericsson, Irons and Tryon (2001), this technique is inadequate to account for the possible reverse causality from economic growth to financial development when data are averaged over decades. Averaging data over long periods may mask the important features of the growth path of the economy and eliminate all dynamics. It may also introduce a spurious contemporaneous correlation between time-averaged variables, although the original series may not be contemporaneously correlated. Both the sign and size of the induced correlation may differ from those of the original series.

Indeed, when financial development is specified as the dependent variable, individual country studies have shown that economic development has a positive impact on financial development (see Demetriades and Luintel, 1997, 2001). Hence, in a single equation framework, the empirical specification derived from any *a priori* theoretical belief has limited use for disentangling the causal relationship of the variables. A more promising approach is to formulate a set of simultaneous equations, which explicitly provides a specification for the financial development equation.

The static assumption of the econometric models adopted in pure cross-country studies reflects a one-period comparative static framework. Hence, the assertion made by these studies that the results represent the long-term economic behaviour is ungrounded. As Ericsson, Irons and Tryon (2001) argue, these analyses omit levels relationship in the specification. Thus, they estimate the short-run rather than long-run relationship. Thiel (2001) stresses the importance of having long time series for analysis of the finance-growth link. Given that cash flows or profits of firms are pro-cyclical in nature, firms' demand for external funds may be subject to the same cyclical patterns. As such, financial development measures may not necessarily be associated with

growth on a short-term basis. Since economic growth is a long term phenomenon, sufficiently long time series are required for the analysis of the finance-growth link.

In more recent years, researchers have tried to ameliorate the shortcomings associated with pure cross-sectional studies by taking into account the time dimension with the use of dynamic panel estimation techniques. Although the use of dynamic panel analysis is an attempt to incorporate the time dimension, averaging out the variables over three or five years (to account for the business cycle effects) may still eliminate dynamics in the model. In addition, this type of regression analysis is also subject to omitted variable problems or heterogeneity bias when the unobserved country-specific effects are included in the error term, and this leads to biased and inconsistent estimates (Pesaran and Smith, 1995). Wachtel (2003) argues that holding country specific effects constant in panel regressions would generate a spurious aggregate relationship as the reported relationship between financial development and economic growth is due to between-country differences rather than within country differences over time. Hence, it appears that it is difficult to draw any reliable policy inferences from these cross-country or panel regression analyses (Demetriades and Andrianova, 2004).

The danger of grouping countries together has been highlighted clearly in an early study by Gupta (1970). Using the same source of data, Gupta (1970) re-estimates the saving functions of Rahman (1968) for all 50 available countries, instead of just 31 as arbitrarily selected by Rahman (1968). His results show that the coefficient of capital flow changes sign and becomes statistically insignificant. In another example, Harris (1997) shows that the results of Atje and Jovanovic (1993), which find a significant correlation between economic growth and stock market transactions over the period 1980-88 for 40 countries, are not robust. Harris (1997) argues that the use of lagged investment as an instrument in their study is inappropriate to deal with the endogeneity issues since lagged investment is not highly correlated with current investment and so not a good instrument. Upon re-examining the results of Atje and Jovanovic's (1993) study, Harris (1997) finds only a weak impact from stock market activity on growth in per capita output.

Furthermore, Garretsen, Lensink and Sterken (2004) find that once legal and other societal factors have been controlled for, the positive association between the stock markets and economic growth found in Levine and Zervos (1998) disappears. By dividing the sample countries into several groups based on the level of financial development, Rioja and Valev (2004) obtain different impacts of financial development

on economic growth.[15] The findings of these studies suggest that the results obtained from cross-country studies are at best ambiguous and fragile. They are subject to the sample countries included in the estimation, the control variables used, the time period covered, and the econometric techniques employed. Hence, cross-country studies are unlikely to yield robust results.

Empirical research on the finance-growth nexus burgeons in recent years with the availability of new data sets compiled by The World Bank.[16] Such data sets involve a large sample of countries, and have been widely employed by many empirical analyses. However, the lack of high quality data with sufficient degree of comparability across countries is a fundamental hindrance for the applicability of the findings of these broad comparative studies.

These broad comparative analyses conducted at the aggregate level are unable to capture and account for the complexity of the financial environments and histories of each individual country. This is because the finance-growth nexus is largely determined by the nature and operation of the financial institutions and policies pursued in each country (Arestis and Demetriades, 1997). As Athukorala and Sen (2002) and Athukorala and Tsai (2003) maintain, cross-country regression analyses are based on a restrictive assumption of "homogeneity" in the observed relationship across countries to which there are always exceptions (outliers). Therefore, without an in-depth understanding of the financial historical context and the financial environment of each individual country, the cross-country evidence provides little policy guidance. In view of these limitations, some researchers put forward strong arguments for time series country specific in-depth studies.[17] As Kirkpatrick (2005) notes, cross-country analyses should be supplemented by empirical studies derived from detailed country case studies.

2.6.3 Time series studies

Using quarterly industrial output data to measure the level of economic development, Gupta (1984) conducts the first time series investigation to study the finance-growth nexus for 14 developing countries. The results indicate that causality runs from financial development to economic growth, suggesting a catalyst role of the

[15] See also De Gregorio and Guidotti (1995), Harris (1997) and Manning (2003).

[16] See Beck, Demirguc-Kunt and Levine (2000) and Demirguc-Kunt and Levine (2001).

[17] See Gupta (1984), Demetriades and Hussein (1996), Edwards (1996), Neusser and Kugler (1998), Ericsson, Irons and Tryon (2001), Kenny and Williams (2001), Athukorala and Sen (2002) and Kirkpatrick (2005), among others.

financial sector in the process of economic development. However, due to a lack of better alternatives, industrial output was used in Gupta's (1984) study. This measure represents only a small portion of total output in most developing countries, and is therefore not a satisfactory indicator for economic development.

In an attempt to test the validity of Patrick's (1966) hypothesis, Jung (1986) conducts Granger causality tests for 56 countries from 1950 to 1981.[18] While the results provide more support for the supply-leading hypothesis, they yield inconclusive findings for reverse temporal causality patterns. As in Gupta's (1984) study, Jung's (1986) results suffer from degrees of freedom problems in the estimation. More recently, Neusser and Kugler (1998) study the finance-growth relationship using financial sector GDP and manufacturing GDP as proxies for financial development and economic growth, respectively. The findings of their causality tests are consistent with the supply-leading view that finance plays an important role in economic development. Similar findings are obtained by Demetriades and Luintel (1996), Choe and Moosa (1999), Luintel and Khan (1999), Rousseau and Wachtel (2000), Xu (2000), Bell and Rousseau (2001) and Rousseau and Vuthipadadorn (2005).

Demetriades and Hussein (1996) and Arestis and Demetriades (1997) assess the finance-growth causal links in developing and developed economies, respectively. Their results exhibit substantial variation across countries even when the same variables and estimation methods are used, highlighting the limitations of cross-country studies for treating different economies as a homogeneous entity. Arestis and Demetriades (1996) provide several accounts for the variation of causality results from country to country. Firstly, different financial systems may have different institutional structures and certain institutional structures may be more conducive to economic growth. Secondly, financial sector policies play an important role in determining whether financial development fosters economic growth. Thirdly, two countries with identical financial systems and financial sector policies may still differ due to the effectiveness of those institutions that design and implement the policies.

In response to the problems of limited data points, Christopoulos and Tsionas (2004) propose the use of panel unit roots and panel cointegration techniques to examine the causality patterns. They find strong evidence of causality running from financial development to economic growth but no evidence of a feedback relationship.

[18] Patrick (1966) argues that the direction of causality between financial development and economic growth changes over the course of development. At the beginning of the growth process, the creation of financial institutions leads to higher growth by transferring resources from traditional sectors to modern sectors (dubbed "supply-leading hypothesis"). However, in the second stage, higher growth creates more needs for financial services and modern financial institutions (dubbed "demand-following hypothesis").

Similarly, using the Geweke decomposition test on pooled data of 109 developing and developed countries from 1960 to 1994, Calderon and Liu (2003) find a bi-directional causality between financial development and economic growth. However, financial development contributes more to the causal relationships in developing countries than in developed countries.

Using time series data from 1960 to 2001, Ang and McKibbin (2007) conduct multivariate cointegration and several causality tests to assess the finance-growth link in the small open economy of Malaysia. To deal with the issue of multicollinearity and over-parameterization problems, they propose the use of principal component analysis to construct a financial development index using the appropriate financial development indicators. Since Malaysia has more features of a bank-based financial system, only banking variables were used in constructing the index. Contrary to the conventional findings, the results strongly support the view that output growth causes financial development in the long-run, but not the hypothesis that a bank-based financial system induces long-term growth in real sector. In a study that explicitly examines the causal impact of stock market developments on economic growth, Caporale, Howells and Soliman (2005) find strong evidence that stock market development in Malaysia enhances economic growth through raising investment efficiency, which in turn increases the productivity of the economy at the aggregate level.

Attempts have also been made to examine the relative importance of banks and stock markets in contributing to economic growth in the time series cotext. Arestis, Demetriades and Luintel (2001) find that banks are more powerful in promoting economic growth. They argue that the role of stock markets has been over-emphasized by cross-country studies. Their results show that in two of the five developed economies examined, stock markets tend to have negative effects on economic growth. However, contrasting findings are obtained by Thangavelu and Ang (2004) using Australia as the case study. In their study, the empirical test results using financial development indicators related to financial intermediaries suggest that the banking sector is reactive to the demand generated from the economic development, i.e., economic growth causes banking development in the Granger sense. On the other hand, the results of using financial market indicators are consistent with Schumpeter's (1911) view that development of the stock market is essential in fuelling economic growth.

Several studies have also attempted to examine the impact of financial repression on development of the financial system. Using India as the case study, Demetriades and Luintel (1997) find that financial repression, measured by a summary

of repressionist controls, has substantial negative effects on financial development. However, the results stand in sharp contrast with a later study by the same authors using Korea as the case study (see Demetriades and Luintel, 2001). In fact, in their sample of six developing countries, Arestis, Demetriades, Fattouh and Mouratidis (2002) find that the effects of financial liberalization on financial development vary considerably across countries.

Table 2.2: Time series evidence on finance and growth: a summary

Study	Sample	Method	Key findings
Gupta (1984)	Quarterly time series data from 1961Q1 to 1980Q4 for 14 developing countries.	VARs and Granger causality	The results indicate that causality runs from financial systems to the economic sector, suggesting a catalyst role of the financial sector. There is some evidence of reverse causality but lesser evidence for a two-way causality.
Jung (1986)	Annual data on 37 less developed countries and 19 developed countries.	VARs and Granger causality	Overall, the results provide some support for the Patrick's supply leading hypothesis that causality runs from financial development to economic development in less developed countries, but a reverse causal pattern is observed in developed countries.
Yaakop (1988)	Annual data for Malaysia from 1960 to 1985.	OLS	Using the ratio of currency-in-circulation to GDP and M1 to GDP as the proxies for financial development, the results imply a positive impact of financial development on economic development.
Demetriades and Hussein (1996)	Annual data for 16 countries (Costa Rica, El Salvador, Greece, Guatemala, Honduras, India, Korea, Mauritius, Pakistan, Portugal, South Africa, Spain, Thailand, Turkey, and Venezuela) with at least 27 observations.	VARs, VECM, Engle-Granger cointegration, Johansen cointegration and Granger causality	Based on the causality results, the study finds little support for the view that finance is a leading factor for economic development. On the whole, the results seem to suggest that financial development and economic growth are jointly determined.
Demetriades and Luintel (1996)	Annual observations for India from 1961 to 1991.	Unrestricted ECM, exogeneity tests and principal component analysis (PCA)	Banking sector controls are found to have negative effects on the process of financial development. On the basis of exogeneity tests, financial development and economic growth are found to be jointly determined.
Arestis and Demetriades (1997)	Quarterly data for Germany and the US for the period 1979Q1-91Q4.	Johansen cointegration, VECM and weak exogeneity tests	The results vary substantially across countries, highlighting the limitations of cross-country analyses. In Germany, causality runs from financial development to real GDP whereas for the case of the US, a reverse causal pattern is found.

Study	Sample	Method	Key findings
Demetriades and Luintel (1997)	Annual data for India from 1960 to 1991.	Engle-Granger cointegration, Stock-Watson cointegration, PCA and weak exogeneity tests	Financial repression, measured by a summary of repressionist controls, has substantial negative effects on financial development. Raising real deposit rate contributes to development of the financial sector. Financial development and economic growth are found to be jointly determined.
Neusser and Kugler (1998)	Annual data for 13 OECD countries for the period 1970-91.	Johansen, Stock-Watson, Horvath-Watson, Phillips-Ouliaris, Engle-Granger, panel cointegration and Granger causality	Cointegration between financial sector GDP and manufacturing GDP is found only in half of the sample countries examined. Causality results show that finance Granger-causes manufacturing TFP. Some feedback relationships are also found in several countries.
Choe and Moosa (1999)	Annual data for Korea covering the period 1970-92.	VARs and Granger causality	The causality tests show that financial development leads to higher economic growth for the Korean experience. Financial intermediaries are more important than capital markets in this causal relationship.
Luintel and Khan (1999)	Annual data for 10 developing countries with 36-41 observations (Costa Rica, Colombia, Greece, India, Korea, Malaysia, the Philippines, Sri Lanka, South Africa and Thailand).	VARs, VECM, Johansen cointegration, weak exogeneity and Granger causality	A bi-directional causality between financial development and economic growth is found in all 10 sample countries. Finance and output are also positively related in the long-run.
Rousseau and Wachtel (2000)	47 countries with annual data for the period 1980-95.	Panel VARs	The analysis shows that stock market liquidity and financial intermediation lead to higher per capita output. The effects of stock market capitalization on output are found to be weaker.
Xu (2000)	Annual data for 41 countries over the period 1960- 93.	VARs and impulse response analyses (IRA)	The results provide evidence that financial development stimulates growth, and investment is an important channel through which finance affects growth. Out of 41 countries examined, 27 countries are found to have positive effects of financial development on investment growth and economic growth.
Arestis, Demetriades and Luintel (2001)	Quarterly data for 5 developed countries, including Germany, the US, Japan, UK and France over the period 1972-98.	Johansen cointegration, VECM and weak exogeneity tests	The results indicate that overall both banks and stock markets promote economic growth. However, the contributions from stock markets are relatively small compared to that of banks. The results also suggest that stock market volatility has negative real effects in Japan, France and the UK.
Bell and Rousseau (2001)	Annual data for India from 1951 to 1995.	Johansen cointegration, VECM, Granger causality and IRA	The results show that financial sector plays an important role in stimulating the economic performance of India. Increases in financial aggregates have preceded increases in both investment and growth. However, financial sector has no influence on the TFP of manufacturing industries.

Study	Sample	Method	Key findings
Demetriades and Luintel (2001)	Annual data for South Korea from 1956 to 1994.	ECM and PCA	The effects of financial restraints on the financial development in South Korea are positive and large. However, the effects of real interest rates on financial development are insignificant.
Arestis, Demetriades, Fattouh and Mouratidis (2002)	Annual data for six developing countries, i.e., South Korea, the Philippines, Thailand, Greece, India and Egypt for the period 1955-97.	VECM, Johansen cointegration and PCA	The effects of financial liberalization are found to vary considerably across the six developing countries under study. Real interest rates have positive and significant effects in four out of the six countries examined.
Calderon and Liu (2003)	Pooled data of 109 developing and industrial countries from 1960 to 1994.	Panel VAR, Geweke decomposition and Granger causality	A bi-directional causality is found between financial development and economic growth. Finance exerts a stronger effect in developing countries. The longer the sample period, the larger the effects of finance. Finance affects growth through both channels of capital accumulation and productivity growth, with the latter channel being more prominent.
Christopoulos and Tsionas (2004)	Annual data for 10 developing countries, i.e., Colombia, Paraguay, Peru, Mexico, Ecuador, Honduras, Kenya, Thailand, Dominican Republic and Jamaica from 1970 to 2000.	Panel VECM, panel cointegration, threshold cointegration and fully modified OLS	Based on panel cointegration analysis, the results show that there is a long-run equilibrium relationship between financial development and economic growth. The long-run causality runs from finance to growth, but there is no feedback relationship observed. There is also no evidence of short-run causality.
Thangavelu and Ang (2004)	Quarterly data for Australia from 1960Q1 to 1999Q4.	VARs and Granger causality	The empirical results using financial development indicators related to financial intermediaries suggest that the banking sector is reactive to the demand generated from the economic development, i.e., economic growth causes banking development in Granger's sense. On the other hand, the results of using financial market indicators are consistent with the Schumpeterian view that development of the stock market is essential in fuelling economic growth.
Caporale, Howells and Soliman (2005)	Quarterly data from 1979Q1 to 1998Q4 for Chile, Malaysia, Korea and the Philippines.	VARs and Modified-WALD (Toda-Yamamoto) tests	The study explicitly examines the causal impact of stock market developments on economic growth. The evidence points to causality running from stock market development to economic growth through increasing investment efficiency.

Study	Sample	Method	Key findings
Ketteni, Mamuneas, Savvides and Stengos (2005)	Panel data of 74 countries for the period 1961-95.	Semiparametric partial linear model	They authors find that the finance-growth nexus is only linear when the nonlinearities between economic growth and initial per capital income, as well as economic growth and human capital, are taken into account. The relationship appears to be nonlinear when these nonlinearities are ignored. Therefore, it appears that the alleged nonlinear finance-growth relationship is not robust.
Rousseau and Vuthipadadorn (2005)	Annual data for 10 Asian countries over the period 1950-2000.	Johansen cointegration, VECM, Granger causality, Modified-WALD (Toda-Yamamoto) tests and variance decomposition analyses	The results show that finance is a key driving force for investment, supporting the factor accumulation channel. However, the role of financial factor in expanding output is found to be weaker.
Stengos and Liang (2005)	Panel data of 66 countries for the period 1961-95.	IV augmented semiparametric partial linear model	The authors employ a semiparametric approach to study the potential nonlinearity of the effect of finance on growth. Their results indicate that a non-linear effect exists in the relationship but the results are sensitive to the choice of the measures for financial development.
Ang (2007c)	Annual data for Malaysia from 1965 to 2004.	VECM, Johansen cointegration, Granger causality and PCA	This study examines the FDI-growth nexus in Malaysia by controlling for the level of financial development. Financial development is measured by a composite index, which is a summary measure of four financial development indicators. The results show that FDI and financial development are positively related to output in the long-run. The impact of FDI on output is enhanced through financial development.
Ang and McKibbin (2007)	Annual data for Malaysia from 1960 to 2001.	VECM, Johansen cointegration, Granger causality and PCA	Based on the causality results, the findings support the view that output growth leads to financial development in the long-run but not the hypothesis that a bank-based financial system induces long-term growth in real sector. Finance and output are positively related in the long-run.

2.6.4 Limitations of time series studies

A majority of the available time series studies are subject to omitted variable problems. In the light of limited data points available for most developing countries, most studies typically specify a time series model, but it rarely contains more than four variables regardless of whether a single equation or a set of simultaneous equations is specified. This involves a real income variable (Y_t), a financial development indicator (F_t), and some control variables (Z_{it}), such as real interest rates, inflation, investment,

etc. The variables in the time series model are always kept to a minimum in order to preserve degrees of freedom. However, there is no compelling reason to believe that $F_t = f(Y_t, Z_{it})$ and $Y_t = g(F_t, Z_{it})$ is an adequate specification of the relationship between financial development and output. This simple specification may be subject to model misspecification problems, and is of limited use to identify the transmission mechanisms linking financial development and economic growth.

Owing to data constraints, the estimation period used in many time series studies is often short. This problem is particularly severe for most developing countries where data are scarce. A meaningful time series analysis requires long series in order to properly account for the persistent dynamics, a feature common in most macroeconomic time series. In order to preserve the degrees of freedom, some studies arbitrarily select only one lag in their empirical model specification. This casts doubt on the reliability of the results, since sufficient lags are required to model short-run dynamics and properly deal with the problems of serial correlation. The results may also be sensitive to the choice of lag length in the econometric specification. Furthermore, using quarterly data to increase the sample size does not fully resolve the problem as a sufficiently long time span is required to make inference on the long-run results.

Analyses based on Granger causality tests may misinterpret the results. This is because expectations about future economic development may induce financial development. If firms anticipate stronger economic performance in the near future, indicating higher demand for financial services, they may invest more in financial services related investments in anticipation of higher future profits. In this sense, financial development is simply a leading indicator rather than a causal factor (Ahmed, 1998). Therefore, such evidence of "causality" must be interpreted with caveats. Furthermore, the Granger causality test is merely an examination of whether the past values of one variable are useful in predicting the current value of another variable. Since causality is assessed relative to the information set at hand, if a variable helps predict another variable, this does not necessarily imply one causes another (Demetriades and Andrianova, 2004). As Diebold (2004) explains, "*X* causes *Y*" is simply the abbreviated expression for "*X* contains useful information for predicting *Y*". Therefore, the causality results should be interpreted in the probabilistic rather than the deterministic sense.

Although individual country case studies provide an important insight, which can be used as a reference for policy formulation, the findings of these case studies are not sufficient to confirm or refute the existing views on the finance-growth relationship.

The results obtained from any particular country cannot be readily generalized or extended to other countries to make inference. Hence, although the use of single country time series analysis allows policy formulation for the particular country under investigation, it is also limited to this country.

2.7 Key Issues

Having discussed the cross-country and time series findings, and the weaknesses associated with these studies, there are still some important unresolved issues in the literature, as outlined below.

Until recently, a major constraint impeding research on the dynamic relationship between financial development and economic growth has been the lack of sufficient time series data for developing countries. As a result, cross-country studies have dominated the literature. Although these studies have made significant contributions to the literature and spurred much research, as Ahmed (1998) points out, the issue of causality cannot be satisfactorily addressed in a simple broad comparative framework. While the findings of these studies provide a useful guide to the finance-growth relationship, they cannot be generalized since such a causal link is largely determined by the nature and operation of the financial institutions and policies pursued in each country.[19] As Solow (2001) proposes, while a group of economies may share some common features each has its own distinctive characteristics. Explaining the evolution of the economic behaviour observed over time requires an economic model that is dynamic in nature. Hence, it is important to carry out country specific studies in order to relate the findings to policy designs within specific cases.

The selection of key variables to indicate the level of financial services produced in an economy and measuring the extent and efficiency of financial intermediation are the main problems in an empirical study of this nature. As Edwards (1996) put forward, "defining appropriate proxies for the degree of financial development is, indeed, one of the challenges faced by empirical researchers." Some studies try to include as many financial proxies as possible in the estimation in order to present a more "complete" picture of financial development. This is particularly obvious in studies that examine the relative importance of a bank-based and market-based financial system. However, this leads to the problems of multicollinearity in both cross-sectional and panel data investigations, as well as over-parameterization in time series analyses.

[19] See Demetriades and Hussein (1996), Arestis and Demetriades (1997), Demetriades and Andrianova (2004), and Kirkpatrick (2005).

In addition, Cole (1988) notes that the commonly used financial development measures (i.e., M2/GDP and bank credit/GDP) are unable to provide a comprehensive picture of the size of the financial systems because there are many types of financial claims which are not recorded. The treatment and classification of these financial claims also differ over time and across countries. This problem is more pronounced in less developed countries with poor financial infrastructure.

Even if data quality is ignored, it is still hard to be sure that any single rudimentary aggregated financial measure would be sufficient to capture most aspects of financial development. This is because countries differ in terms of their financial structure, degree of concentration of financial institutions, size of financial institutions and instruments, efficiency of financial intermediaries, volume of financial transactions, and effectiveness of the financial regulatory framework.

M2/GDP, and bank credit/GDP are highly aggregated measures of financial development. They are often used to proxy financial development for convenience, despite the possibility that different components of financial system (stock markets, banks, insurance companies, etc.) may have different impacts on economic growth. As noted by Gurley and Shaw (1955), in the early stages of financial development, financial intermediaries are predominantly banks, providing lending and transactions services. Under such circumstances, money stock is a reliable proxy to measure the extent of financial intermediation. However, as the financial systems evolve, the use of money stock becomes inappropriate with the emergence of other types of more complex financial intermediaries. Furthermore, it appears that using different measures of financial development may give rise to different conclusions about how financial development and economic growth are related. These crude measures of financial development must be interpreted with caveats. For example, a high ratio of private credit/GDP or M2/GDP does not necessarily indicate a high level of sophistication in the financial systems. In the case of Malaysia, while these ratios were relatively high before the Asian financial crisis, they do not necessarily indicate the existence of a sound and efficient financial system (Athukorala, 2001; Hill, 2005).

Thiel (2001) highlights that a significant portion of the bank loans issued to the private sectors may be used to finance housing loans instead of being channelled to fund productive activities. Furthermore, with increasing global financial integration, domestic financial indicators are not sufficient to capture development in the financial systems. In recent years, increasing merger and acquisition activities have been an important force for raising funds from stock markets. Thus, funds raised from stock

markets are not necessarily used to finance investment projects, casting doubt on the reliability of financial development indicators based on stock market measures.

While examining the importance of financial markets, research has so far mainly focused on the role of banks. These studies play down the contributions from other components of the financial system, such as pension funds, insurance companies, bond markets, share markets, etc., on the grounds that these intermediaries are relatively new and small and therefore provide little funds to spur growth. Ignoring the rapid development of these intermediaries may lead to significant underestimation of the level of financial development. Furthermore, informal finance (curb markets) is also often neglected in the discussion as some economists view the informal sector as an unorganized and immaterial sector in generating resources to spur economic growth (Chandavarkar, 1992). Although informal finance may play a substantial role in intermediating resources in developing countries, it is difficult to gather these data.[20]

Institutional factors have largely been ignored by most empirical studies. Since each country differs in terms of the quality of their regulatory authorities, the legal system and contract enforcement, barriers to participation of foreign banks, the perceived importance of the financial sector as an instrument of growth by the government, etc., financial intermediaries and financial markets are only as good as the environment in which they operate. Driffill (2003) highlights that while some of the empirical results on the positive influence of financial development look convincing, they must be interpreted with caveats since they may just be picking up other features of the countries involved e.g., legal factors, institutions, geography, etc. Although it is often argued that the success of any financial sector policy critically depends on the existence of good governance, most studies take no account of institutions in their analysis, mainly because it is very difficult to find an appropriate proxy for institutions. Hence, the results obtained from these studies are far from complete. As Morck and Steiler (2005) argue, "financial development is not a given, but depends on politics and history." This also raises concerns about treating financial development as a purely exogenous variable.

Empirical studies generally suffer from a fundamental limitation in their approach to understanding the finance-growth nexus. Cross-country studies typically employ Barro's (1991) regression model and augment it with some financial development indicators. Even though attempts have been made by using 2SLS or

[20] For an insightful analysis on informal markets in developing countries, see Jagannathan (1987). Fry (1995) provides an excellent survey of studies on informal finance in Asia.

instrumental variables estimators to account for the potential endogeneity of financial variables, this single equation approach does not capture the full interaction between financial development and economic growth. A more promising way of describing the finance-growth relationship is to use a system of equations by explicitly modelling for economic growth, financial development and other variables concerned. Although time series approaches with a VAR specification treat all variables in the model as endogenous, these reduced form equations contain little theoretical backing.[21] Structural VARs were invented to deal with this problem. However, they are accused of imposing too stringent (often zero) restrictions on the model. As a result, empirical researchers often struggle in choosing an appropriate approach.

2.8 Conclusions

There is ample cross-country empirical evidence pointing to a positive impact of financial development on economic growth. This chapter highlights some methodological reservations about these empirical findings. In addition, it is well-known that there are significant differences among developing countries in which various structural features and institutional aspects may have a direct bearing on the impact of financial development in the process of economic growth. Hence, this thesis proposes a country-specific in-depth case study to examine the issue at hand. The next chapter provides an overview of the Malaysian economy and its financial system before proceeding to examine the channels that link financial development and economic growth.

[21] A possible way to improve on it is to consider imposing some theory models on VAR. However, econometric methodological philosophy is not dwelled on here. Interested readers can refer to McKibbin, Pagan and Robertson (1998) and Kapetanios, Pagan and Scott (2005) for interesting attempts to impose some theory models on VARs.

CHAPTER 3: THE MALAYSIAN ECONOMY AND ITS FINANCIAL SYSTEM

3.1 Introduction

In order to set the stage for the later analyses, this chapter provides an overview of the Malaysian economy and development of its financial system from a historical perspective. The chapter focuses on a number of key "stylized facts" about the Malaysian economy which have a direct bearing on the subject at hand. Firstly, Malaysia is a relatively small but high growth economy which relies heavily on international trade for its growth dynamics. Secondly, throughout the post-independence era Malaysia has maintained a relatively open foreign trade and investment regime. The rapid growth of the economy has had much to do with its openness and trade orientation. Thirdly, during most of the period under study, Malaysia has maintained an impressive track record of pursuing prudential macroeconomic policies. The central bank has been able to maintain price stability in the economy where inflation has always been very well-managed, except during period of external shocks, such as oil crises. Fourthly, with the exception of the racial riots in 1969, Malaysia has been able to enjoy a stable political environment.

The following section discusses the policy framework of the Malaysian economy. Section 3.3 gives an overview of the Malaysian growth experience. Sections 3.4 and 3.5 discuss financial sector development and financial sector reforms in Malaysia, respectively. Components of the financial system are discussed in section 3.5. Saving behaviour and investment patterns are discussed in sections 3.6 and 3.7, respectively. Section 3.8 analyses the saving and investment relationship, and the last section concludes.

3.2 The Policy Framework: An Overview

Malaysia achieved independence on 31 August 1957. At the time of independence, economic conditions in Malaysia appeared conducive to sustained economic growth. The newly independent government inherited from the British colonial administration a well-developed infrastructure, an efficient administrative system, and a growing primary export sector with ample potential for expansion. In terms of educational attainment and standard of living, Malaysia was well ahead of most of its neighbouring countries (Snodgrass, 1980).

Economic performance was generally regarded as very good after independence, as reflected by the rapid expansion of the economy. The First Malaysia Plan (1966-70), a five-year economic development plan, was outlined in the early 1960s to promote the welfare of all citizens. Increasing concern about income inequality among major ethnic groups accompanied this development, threatening the political and economic stability of the country.[22] Although political power was dominated by Malays, who accounted for more than half of the population in the 1960s, they were relatively poor and mainly engaged in low productivity agricultural activities. Ethnic Chinese, who accounted for about one-third of the population, were relatively well-off and controlled most of the modern-sector productive activities. As a result, sustainable economic growth was questioned by native Malays, who felt the benefits of income growth were being concentrated in the hands of ethnic Chinese (Snodgrass, 1980; Bhalla and Kharas, 1992). Income inequality over the 1960s continued to worsen and resulted in growing inter-racial tension. In fact, from independence in 1957 to the general election in 1969, household incomes of the *bumiputras* grew least rapidly, while those of ethnic Chinese grew most rapidly (Chee, 1990; Lucas and Verry, 1996). This deteriorating situation eventually led to the bloody racial riot following the outcome of the general election in May 1969.

In response to the May 1969 riot, the New Economic Policy (NEP) was instituted in 1970 to improve inter-ethnic relations through the eradication of poverty by raising income levels and increasing opportunities for all Malaysians, irrespective of race, and through rapid reordering of the society to correct economic imbalances, so as to reduce, and eventually eliminate, the identification of race with economic function. Specifically, this twenty-year program aimed to expand the corporate shareholding, employment and education opportunities of the *bumiputras* so they would be able to improve their standard of living. The NEP became the key reference for the formulation of economic development policies, remaining in place for the next two decades and beyond. Given that the main political and economic objectives of the NEP were to redistribute the financial wealth of the minority non-*bumiputras* to the *bumiputras*, implementation of the NEP inevitably involved a series of pro-*bumiputra* affirmative action programs. Since its inception, the inter-ethnic gaps in household incomes have narrowed significantly (Snodgrass, 1980; Lucas and Verry, 1996).

[22] Malaysia is a plural society with the population made up from different ethnic groups. The major ethnic groups are the *bumiputras*, which comprises Malays and other indigenous people (61.4 per cent), ethnic Chinese (23.7 per cent), Indians (7.1 per cent) and others (7.8 per cent) (Department of Statistics, 2005).

A series of privatisation and restructuring of state-owned enterprise activities took place from the mid-1980s. Alongside this development was an emphasis on promoting heavy industry through government involvement under the fourth Prime Minister Mahathir's "Look East" policy (Crouch, 1996). Huge saving and export growth, coupled with political stability, ethnic harmony, and effective reforms in the financial system, raised the status of Malaysia to middle-income level in the 1980s. This remarkable economic performance coincided with implementation of the NEP and the five-year economic plans.

The Malaysian economy was hit by the collapse of commodity prices at the end of 1985 (Corden, 1996). As a result, aggregate output fell dramatically by 4 per cent in 1985, unemployment increased from 5.8 per cent in 1984 to 8.3 per cent in 1986, and the economy entered a recession. In response to this adverse situation, the government carried out a privatization policy to promote the private sector as the key engine of economic growth. The government also spent massively on infrastructure to accelerate industrialization in line with the aim to transform Malaysia into a newly industrialized economy. At the same time, regulations on foreign equity participation in Malaysia were relaxed. Other measures introduced to stimulate growth and reduce unemployment included low-cost housing schemes, speedier approval of licenses for small business, new public infrastructural projects, retraining programs for the unemployed, etc. (Yusof, Hussin, Alowi, Lim and Singh, 1994).

The NEP was extended for another decade in 1990 with some modifications, under the new label of the National Development Policy (NDP) (Snodgrass, 1995). This policy was complemented by Vision 2020 formulated in 1991, which projected Malaysia to be a fully industrialized nation within the next three decades. Most of these proposals were related to providing a sound infrastructure base, maintaining macroeconomic stability, and developing human capital. Throughout the 1991-96 period, budget deficits were well-managed at a low level, and mainly financed by a non-inflationary source – the Employee Provident Fund (EPF). The government was also able to service external loans and reduce borrowing due to the sound performance of the economy (Khan, 2002). In addition, the unemployment rate, prices and the exchange rate were well-managed and remained stable. There was also a considerable reduction in the incidence of poverty, where the *bumiputra* racial group made significant progress in the modern sectors of the economy.

Malaysia was severely hit by the Asian financial crisis in 1997-98, but rebounded quickly in 1999-2000 (Athukorala, 2001). The Asian financial crisis initially

started off as a currency crisis, but rapidly translated into a financial crisis following the weakening of the banking system. This subsequently deteriorated into an economic recession.[23] It is widely believed imprudent supervision and sustained strong credit growth prior to 1997 were partly accountable for the crisis.[24]

While Malaysia's initial approach to crisis management was to follow the measures prescribed by the IMF, the government eventually chose an unconventional route by adopting a capital control regime. Capital controls were deemed necessary by policy makers to prevent massive capital flight. For a small open economy like Malaysia, a drastic movement in short-term capital can lead to volatility in the financial system. Macroeconomic policies were aimed at reducing current account deficits, combating inflation, and managing the excess demand triggered by high credit growth. The National Economic Action Council (NEAC) was set up in January 1998 to address the deteriorating economic conditions and revitalize the economy. Six months later, the National Economic Recovery Plan was launched to provide a comprehensive framework for economic recovery (BNM, 1999). BNM took further action to deal with the adverse consequences of the crisis on the financial system by providing a deposit guarantee to depositors and liquidity support to banks to strengthen stability. Two special agencies, namely *Danaharta* (an asset management company) and *Danamodal* (a recapitalization agency), were set up to buy non-performing loans at a discount and inject new capital in certain institutions, respectively. These two agencies were complemented by the Corporate Debt Restructuring Committee (CDRC), which provided an opportunity for ailing banking institutions and debtors to work out feasible restructuring schemes without having to resort to legal proceedings. In addition, BNM was prompted to introduce selective capital controls and fix the exchange rate at US$1=RM3.80 effective from 2 September 1998. These measures brought about a stable domestic economic environment and remained in place until July 2005.

After the crisis, NDP has been replaced by the National Vision Policy 2001-2010 (NVP), emphasizing achievement of rapid economic growth as the key policy for

[23] Before 1997, there were many speculative bubbles and overheating in the Malaysian securities and real estate markets due partly to the ease of borrowing. As the crisis broke in Thailand, market confidence collapsed. Massive capital outflows exerted severe downward pressure on asset prices. These capital outflows accelerated in July when the Thai Baht was devalued. This was followed by a sharp depreciation in the Ringgit, and a significant reduction in both domestic and external demand. Equity values and real estate values plunged, resulting in a significant erosion of individual financial wealth. During this period, investment projects launched by highly leveraged firms failed, non-performing loans increased significantly, and much uncertainty surrounded the economy.

[24] For more debates on the causes of the Asian financial crisis, see Corsetti (1998), Corsetti, Pesenti and Roubini (1998a, b), Radelet and Sachs (1998), Stiglitz (1999a, b) and Krugman (2001).

development. However, the new policy still contains some strong elements of affirmative action programs, mainly targeted at improving the living standards of the *bumiputras*. Malaysia has mainly relied on the five-year economic plans to implement its development strategy throughout the last few decades.[25] These plans have been basically aimed at charting the government development strategy to achieve a high level of economic growth and reducing economic disparities and poverty (Khan, 2002). To a large extent, these plans were designed to complement the objectives of other core policies, such as NEP, NDP and NVP. All of these national economic plans place strong emphasis on developing the infrastructure base, which has greatly facilitated the undertaking of investment activities. It is important to note that these Malaysia plans are basically "public sector investment plans" whereas plans for the private sector are largely "indicative plans". The government has never been directly involved in planning private sector investment activities. This is one of the key reasons behind the success story of Malaysia's economic development.

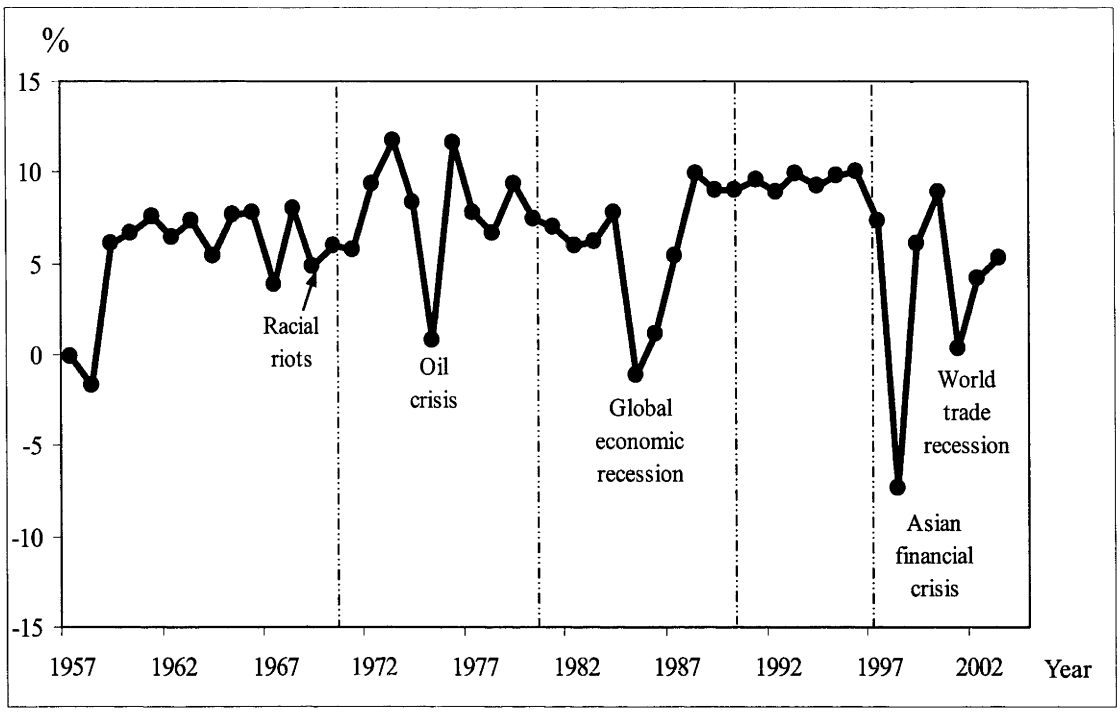
3.3 The Malaysian Growth Experience

This section provides an overview of Malaysia's growth experience, segregated into five distinct phases: 1) the early post-independence period (1957-70); 2) the soaring 1970s; 3) the structural adjustment period in the 1980s; 4) investment booms in the 1990s; and 5) Asian financial crisis and the recovery period (1997-2003), as illustrated in Figure 3.1.

During the post-independence era, Malaysia provided a fundamentally sound environment to attract investment. This was based on a rich natural resource base, the ample availability of financial resources due to the huge presence of foreign banks, the supply of a relatively well-trained labour force, and the provision of an adequately developed infrastructure base. These factors, together with the presence of a large plantation sector, were important in generating rapid industrial growth in the 1960s, which had a far-reaching impact on economic development for the next two decades. Real GDP growth accelerated from a negative rate of -0.1 per cent in 1957 to a respectable rate of 7.8 per cent in 1966, but slowed slightly to 6.0 per cent in 1970. Economic growth in the 1960s was accompanied by an improvement in living standards, better access to health and education, and a higher level of urbanization (Yusof, Hussin, Alowi, Lim and Singh, 1994; Narayanan, 2004).

[25] The First Malaysia Plan (1966–1970) was the first economic plan for the whole of Malaysia, aimed at improving the living standards of all citizens.

Figure 3.1: GDP growth of Malaysia, 1957-2003



Sources: compiled from Nazrin (2000) and World Development Indicators (2005).

3.3.1 An overview of economic growth

The 1970s marked a significant improvement in the performance of the manufacturing sector. During the period 1971-80, the manufacturing sector grew by an average annual rate of 22.9 per cent, accounting for 21.6 per cent of GDP in 1980. This was underpinned by a boom in export-oriented and labour-intensive industries, such as electronics, textiles and wool products. This impressive performance was largely the result of government efforts in attracting and promoting export-oriented industries through the establishment of free trade zones from the early 1970s. The economy grew strongly at an average annual rate of 7.9 per cent due to the exceptional performance of these industries (Yusof, Hussin, Alowi, Lim and Singh, 1994).

However, the performance of the economy was severely affected by the oil crisis that led to the world recession of 1975. Real GDP growth declined sharply from 8.3 per cent in 1974 to 0.8 per cent in 1975. Inflation increased rapidly from 3.2 per cent in 1972 to 17.3 per cent in 1974. The government responded to this marked decline in growth by massive spending on public investment projects. Average public investment spending grew nearly three-fold between the periods 1971-75 and 1976-80, providing a strong impetus to fuel economic recovery. As a result, the growth rate of real GDP had rebounded to 9.3 per cent by 1979.

GDP in the 1980s registered an average annual growth rate of 6.0 per cent, about 2 percentage points lower than the previous decade. This was mainly due to a sharp fall in commodity prices, following a prolonged global economic recession in the early 1980s. By the end of 1982, the government faced a twin deficit situation: a fiscal deficit at 18 per cent of GNP and a current account deficit at 14 per cent of GNP. In view of these problems, external borrowing was sought, resulting in a significant increase in external debt from RM 10 billion (19.5 per cent of GNP) in 1980 to RM24.3 billion (40.7 per cent of GNP) at the end of 1982 (Othman, 1987; Lin and Chung, 1995).

The economy entered a recession when the prices of several main export commodity prices collapsed in 1985. Total export income fell by 1.6 per cent and 6.2 per cent in 1985 and 1986, respectively. This had an adverse impact on the economy when deflation followed, and share prices and property prices fell dramatically. As a result, real GDP contracted by 1 per cent. Following an improvement of external condition that led to a spectacular performance in the export sector, the economy recovered rapidly from 1987, achieving a high annual growth rate of more than 9 per cent during the period 1988-90.

The 1990s saw exceptional growth in the Malaysian economy, with an annual average growth rate of 9.6 per cent during the period 1991-96. This strong growth record was mainly due to active promotion of the private sector as the main driver of economic development. Alongside this development was a massive influx of foreign direct investment (henceforth FDI), where the average ratio of FDI to GDP increased two-fold from 3.3 per cent during the period 1981-90 to 6.6 per cent during the period 1991-96. The share of FDI in total investment reached a record high of about 23 per cent in 1992. This remarkable increase in FDI was partly due to the government granting of attractive FDI incentives, including location incentives, tax allowances, and double deduction for promotion of exports, etc.[26]

The performance of the Malaysian economy was severely affected in the wake of the Asian financial crisis, which led to a corresponding decline in the growth rate of GDP. In 1998, the economy recorded a negative growth rate of 7.4 per cent. From 1997 to 2003, the average annual real GDP growth rate was much lower at 3.5 per cent. As highlighted earlier, macroeconomic and financial sector policies were formulated to

[26] Kohsaka (1996) provides a good review of the changing patterns of capital flows in the Asian-Pacific region. His study investigates the role of Japan as a major capital supplier as well as a financial intermediary in the Asian Pacific region. The importance of FDI for Malaysia has been highlighted in this study where the results show that Malaysia depends on FDI for a crucial part of its net capital inflows and has an integrated capital market with Japan.

deal with this adverse situation. The economy recovered rather quickly and in 1999, real GDP grew by 6.1 per cent from the previous year. However, the growth rate was moderated to 0.3 per cent when the world trade recession took place in 2001. In the subsequent two years, the economy grew at an average rate of 4.7 per cent.

3.3.2 Comparison with other Asian countries

In 1960, Malaysia was one of the highest per capita income countries in the Asian region, after Japan, Hong Kong, Singapore, and South Korea (see Table 3.1). This ranking remained unchanged over the next three decades. Annual real GDP growth during the period 1961-80 averaged 7.2 per cent, above the performance of many other Asian developing countries. The growth rate increased marginally to 7.4 per cent during the period 1981-96, prior to the Asian financial crisis. Over the entire period of 1961-2003, Malaysia's average real GDP growth rate was higher than Indonesia, the Philippines, Japan, Bangladesh, India, Pakistan and Sri Lanka, but lower than that of Singapore, Thailand, China, Hong Kong and South Korea.

Table 3.1: Per capital income and economic growth

Country/ Region	GDP per capita, constant 2000 US$				Real GDP growth (%)			
	1960	1980	1996	2003	1961-80	1981-96	1997-03	1961-03
Malaysia	**816**	**1,848**	**3,721**	**4,011**	**7.2**	**7.4**	**3.5**	**6.7**
Southeast Asia								
Indonesia	204	397	878	874	6.0	6.9	1.5	5.6
Philippines	626	990	948	1,035	5.4	2.2	3.5	3.9
Singapore	2,425	8,926	19,900	22,238	9.4	8.0	3.8	8.0
Thailand	340	798	2,155	2,276	7.5	8.0	1.7	6.8
East Asia								
China	72	173	654	1,067	5.5	10.2	8.1	7.7
Hong Kong	3,305	11,344	22,583	25,627	9.6	6.1	2.7	7.2
Japan	7,876	23,897	36,417	38,222	7.5	3.2	0.9	4.8
South Korea	1,133	3,223	9,712	12,236	7.8	8.3	4.2	7.4
South Asia								
Bangladesh	247	231	302	381	2.6	4.4	5.2	3.5
India	178	222	391	511	3.6	5.7	5.6	4.7
Pakistan	192	327	522	545	6.0	5.7	3.1	5.4
Sri Lanka	284	446	758	921	4.5	4.6	4.2	4.5

Source: compiled from World Development Indicators (2005).

Table 3.2 shows that Malaysia fares relatively well in terms of per capital income (measured in US$), compared to low- and middle-income countries. Per capita real GDP, which is often viewed as an adequate measure for standard of living, indicates that the living standards of a majority of Malaysians have improved significantly over time.

Table 3.2: Average GDP per capita (constant 2000 US$)

Period	Malaysia	Low-income (N=59)	Middle-income (N=94)	High-income (N=55)
1961-70	$956	$221	$760	$11,240
1971-80	$1,479	$249	$1,082	$15,634
1981-90	$2,145	$282	$1,326	$19,306
1991-96	$3,162	$326	$1,478	$22,842
1997-03	$3,808	$391	$1,750	$25,893

Source: compiled from World Development Indicators (2005).

Table 3.3 shows the average growth rate of per capita real GDP in Malaysia was about 3.5 per cent per annum during the 1960s. This rate of growth was higher than low- and middle income countries, but lower than high-income countries. For the subsequent periods prior to the 1997-98 Asian financial crisis, the average growth rate of per capita income in Malaysia was substantially higher than that of low-, middle-, and high-income countries. However, due to the effect of the Asian financial crisis, Malaysia's per capita real GDP growth rate shrank significantly during the period 1997-03.

Table 3.3: Per capita real GDP growth rates (%)

Period	Malaysia	Low-income	Middle-income	High-income
1961-70	3.5	1.7	3.2	4.1
1971-80	5.3	0.7	3.5	2.6
1981-90	3.1	1.9	1.1	2.4
1991-96	6.9	2.0	2.0	1.5
1997-03	1.2	2.9	2.8	1.8

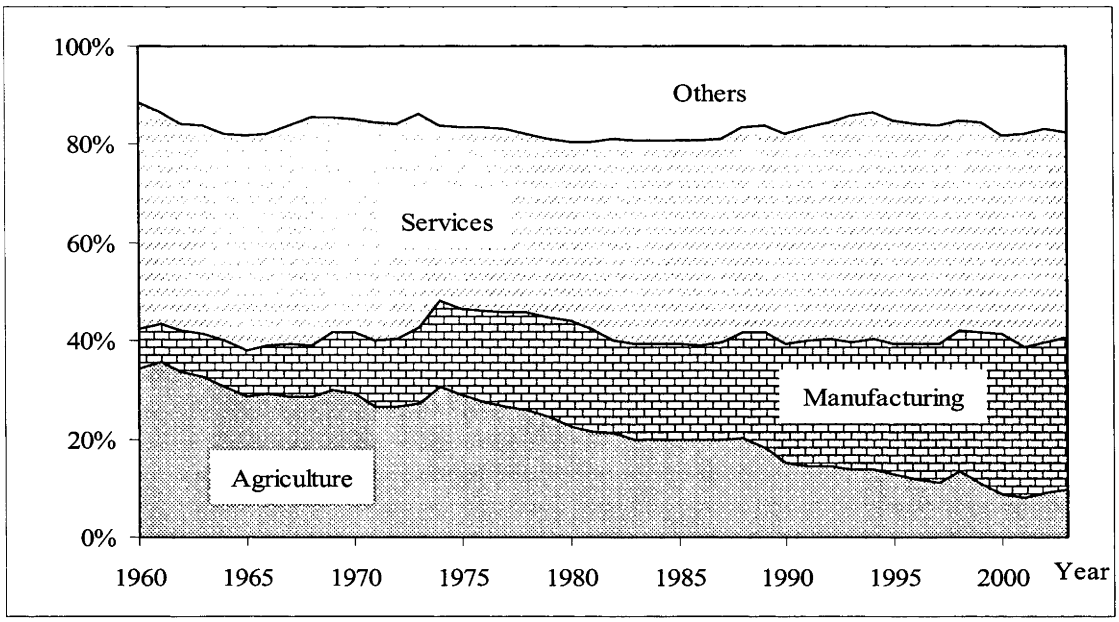
Source: compiled from World Development Indicators (2005).

3.3.3 Structural change of the economy

The discussion now turns to the structure of the Malaysian economy. Trade had a significant impact on economic structure of the country. At independence, the primary sector accounted for 45 per cent of GDP, the tertiary sector, which mainly played a supporting role for the primary sector, accounted for another 44 per cent, and the manufacturing sector made up the remaining 11 per cent. Exports constituted about 46 per cent of GDP, indicating a huge export sector primarily dominated by the rubber and tin industries. The country's highly open economy was responsible for a standard of living among the highest in Asia (Lim, 1975).

The structure of the Malaysian economy has undergone a remarkable transformation since independence. With the adoption of a sound policy mix and effective implementation of these development policies, Malaysia has successfully shifted the structure of its economy from an agriculture-based economy to one based on industries that produce a variety of manufactured goods. Figure 3.2 shows that the share of agriculture value-added has declined gradually over the years and the manufacturing sector has become increasingly important. Between 1960 and 2003, the manufacturing sector grew by an average of 14 per cent per year, with the share of manufacturing in GDP increasing from 8 to 31 per cent as a result of the aggressive export-orientation strategy pursued by the country. In contrast, the share of agriculture in GDP declined from 34 to 10 per cent. The importance of services and other sectors, in terms of GDP share, has remained more or less unchanged over the years.

Figure 3.2: The economic structure of Malaysia, by share of value-added, 1960-2003



Notes: "Services" includes value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. "Others" comprises value added in mining, construction, electricity, water, and gas.
Source: compiled from World Development Indicators (2005).

Table 3.4 shows that Malaysia's output growth was mainly attributable to expansion in the manufacturing sector, particularly in the 1980s and 1990s. The contribution to output expansion from the agriculture sector declined dramatically during the 1980s as a result of rapid industrialization. Since the 1990s, much of the increase in output came from the manufacturing and services sectors. Noticeably, except for the post-crisis period, the service sector has been the most significant contributor to economic expansion over the years. Contributions from other sectors have changed little throughout the last four decades.

Table 3.4: Contribution of each sector to output increment (%)

Sector	1961-70	1971-80	1981-90	1991-96	1997-03	1961-03
Agriculture	21.4	21.2	9.2	8.6	6.2	9.2
Manufacturing	18.4	24.4	27.4	30.5	37.8	31.5
Services	43.3	33.5	46.8	46.2	35.5	41.8
Others	17.0	20.9	16.6	14.7	20.6	17.5

Source: compiled from World Development Indicators (2005).

3.4 Financial Sector Development

Development of Malaysia's financial system mainly evolved through the channel of international trade during the colonial period. A simple and stable monetary regime – the currency board system – emerged during this time, providing the necessary currency exchange service to facilitate the expansion of trade and foreign capital inflow (BNM, 1989). The gold-exchange standard incorporated the Malayan currency into the gold standard by fixing it to the gold-based British currency at the exchange rate of one Malayan dollar equalled 2s.4d. (Drake, 1969b; Huff, 2003). Bank Negara Malaysia (the Central Bank of Malaysia, henceforth BNM) was set up in 1959 alongside the currency board system. However, it had little role to play in the monetary system before the cessation of the issuance of currency by the currency board in 1967. Since then, it has been playing a pivotal role in promoting development of the financial sector. A list of the financial sector policies adopted in Malaysia since the establishment of the Central Bank is provided in Appendix 1.

The financial structure in the early 1960s mainly comprised the commercial banks, which were basically set up to provide the services of trade financing. Hence, the primary development force in the financial system in these early days was the volume of international trade. During this period, commercial banks were mostly owned by foreigners and headquartered in London. The key objective of BNM in the 1960s was to establish a basic infrastructure for the domestic financial system. This was achieved by developing domestic banks to complement the well-established foreign banks.

These efforts were carried into the 1970s when other financial intermediaries, such as finance companies, merchant banks and development finance institutions, were subsequently set up by BNM to cater for other financial services not provided by commercial banks. New legislation was passed to bring these financial intermediaries under the supervision of BNM (BNM, 1999). At the same time, the informal financial sector was able to mobilize substantial resources in the financial system. However, due to the lack of reliable data, these unorganized financial intermediating activities were not reflected in the official statistics.

The 1980s can be characterized by a period of high volatility in the financial system. Following failure of the Overseas Trust Bank (OTB) in Hong Kong in July 1985, there had been many rumours regarding the stability of the banking system in Malaysia. In September 1985, the first deposit-taking institution in Malaysia failed, causing severe anxiety among depositors. Three months later, the failure of a large public listed company in Singapore, Pan-Electric, led to a three-day closure of the Kuala

Lumpur Stock Exchange (KLSE). As a result, there were sporadic runs throughout the following year against the weaker financial institutions (Lin and Chung, 1995). A few cooperative finance companies and banks failed, and were bailed out by BNM. Laws were passed to bring them under close supervision by BNM (Ariff and Khalid, 2000). In view of this, most efforts made by BNM in the late 1980s were focused on restoring confidence in the financial system and further strengthening the regulatory framework in the banking system.

The 1990s were characterized by rapid development in the financial sector due to strong economic growth, a high saving rate, and advancements in telecommunications. These changes have had a significant impact on the functioning of financial institutions and financial markets, and led to the emergence of a variety of financial products and services. However, this rapid development was interrupted when the economy was hit by the 1997-98 Asian financial crisis. The crisis highlighted the importance of maintaining financial stability for the sustained development of an economy. It put BNM under great pressure to promote a competitive banking system while preserving financial stability. Therefore, the key challenge faced by BNM in the aftermath of the crisis was to improve financial stability.

Financial instability emerges when the failure of one or more financial institutions triggers adverse effects on the financial system (e.g., price misalignment and resource misallocation) as well as on the economy as a whole. These negative consequences can spill-over to destabilize financial systems in other countries, as was clearly illustrated in the case of the 1997-98 Asian financial crisis (BNM, 1999). Financial stability ensures that the functions of the financial systems are effectively carried out, resulting in effective allocation of resources and promoting sustained economic development. Financial stability is also important for the reason that it is vital for the effective conduct of monetary policy, which is mainly carried out through the banking system. However, this would not be possible without the presence of a sound supervisory framework. In this regard, the functional role of BNM in strengthening the regulatory framework in the financial system is indispensable. To achieve financial stability, various reforms have been carried out by BNM in the Malaysian financial system, as will be seen below.

3.5 Financial Sector Reforms

The existence of an effective prudential regulatory framework is critical as it minimizes the risk of financial instability. In 1988, supervision of the insurance industry

was brought under the purview of BNM, with the aim of streamlining supervision of the entire financial system and realizing economies of scale. In October 1989, the introduction of the Banking and Financial Institution Act 1989 marked an important step taken by BNM to strengthen the prudential and regulatory framework in the financial system (Hussein, 1994). The Act enhances the powers and duties of the auditors of licensed institutions. In September 1996, the Insurance Act 1996 came into force to further enhance the legislative framework governing the supervision of the insurance industry (BNM, 1999).

BNM has also consistently reviewed its supervisory approach by concentrating on high risk areas that may have an undesirable impact on the financial system. In this connection, minimum standards on risk management for derivatives were introduced in 1996, and guidelines on minimum audit standards implemented in 1997. These measures were aimed at enhancing the soundness of corporate governance. Furthermore, disclosure requirements were improved by requiring banking institutions to publish key indicators of financial soundness on a more regular and timely basis. Measures were also introduced in the financial markets to improve transparency and protect the interests of minority shareholders (BNM, 1999).

BNM has actively pursued interest rate liberalization, with the objective of developing a more market-driven financial system. BNM followed a gradual approach in interest rate reforms, beginning in the 1970s by cautiously liberalizing interest rates. The major phase of interest rate liberalization occurred in 1978 when commercial banks were allowed to set deposit and lending rates freely (Hussein, 1994). However, the market-determined interest rate mechanism was interrupted from October 1985 to January 1987, when BNM imposed controls on interest rates to mitigate the impact of the world economic recession on Malaysia. In February 1987, BNM abandoned the pegged deposit rate regime, and in September 1987 turned to the use of the base lending rate (BLR) to control interest rates. These interest rate controls remained in force until 1991 (Yusof, Hussin, Alowi, Lim and Singh, 1994).

From February 1991, the BLR of banking institutions was completely freed from administrative control. All commercial banks and finance companies were allowed to set their own deposit and lending rates (Yusof, Hussin, Alowi, Lim and Singh, 1994). Lending rates were subject to a maximum of 4 percentage points above the declared BLR. As a result of this policy, deposit and lending rates were competitively determined by market forces. Furthermore, in 1995 a new BLR framework was introduced to reduce time lag by linking the BLR to the weighted monthly average of the 3-month

inter-bank rate. In order to further reduce the transmission lag, in 1998 the BLR was linked to the 3-month BNM intervention rate instead of to the 3-month inter-bank rate (BNM, 1999).

In the past, Malaysia has been reluctant to relax foreign ownership restrictions in the financial sector. However, with a view that opening the financial sector to foreign institutions will introduce international standards of best practice and increase competitiveness, Malaysia has gradually recognized the importance of opening up the domestic financial sector to foreign competition. This has allowed the financial system to play a more efficient role in mobilizing and channelling financial resources to fuel economic development. At the same time, it is important to note that potential undesirable effects might have followed if liberalization had not been carried out in a prudent manner. In this connection, Malaysia has adopted a gradual and progressive approach to liberalize its financial sector. The pace of financial liberalization has been compatible with the prevailing economic conditions and regulatory framework (BNM, 1999).

These liberalization policies have resulted in a high level of foreign participation in the domestic financial sector. For instance, in 2003 there were 11 fully foreign-owned commercial banks in the financial system, which accounted for about 25 per cent of the total assets of commercial banks (BNM, 2004). Stiff competition in the banking industry has resulted in narrowing of the gross interest margins of commercial banks, from 4.1 percentage points in 2001 to 3.7 percentage points in 2003. Foreign banking institutions have expanded their loan market share, mainly in housing loans, whereas the domestic banking institutions have continued to be the key provider of financing for business, particularly for small and medium enterprises (BNM, 2004). There has also been a strong foreign presence in the insurance industry following liberalization of the insurance sector in the early 1960s. In 2003, there were 28 foreign-owned insurers in the financial system. The foreign market shares of life insurance premiums and general insurance premiums were about 76 per cent and 39 per cent, respectively (BNM, 2004).

Malaysia remains very committed to further liberalizing its financial sector. This was reflected by the signing of the Interim Agreement on the financial services sector in 1995 and the Fifth Protocol of the General Agreement on Trade in Services (GATS). In the latter, Malaysia has committed to increase the aggregate foreign equity limit in insurance companies to 51 per cent, and to open up offshore investment banking, offshore insurance, and offshore financial leasing (BNM, 1999). In 2000, the maximum foreign equity in a stockbroking company and a financial leasing company was

increased from 30 to 49 per cent. The maximum credit that could be obtained by a non-resident controlled company from foreign-owned banking institutions was raised from 40 to 50 per cent, and this constraint was subsequently removed in 2003. Furthermore, foreign banks were allowed to provide internet banking services in 2002 (BNM, 2004).

The liberalization policies adopted by BNM seem to have worked well at the early stage of development, when financial development was observed. The monetization ratio (M2/GDP), which is commonly used as a crude indicator of financial development, increased remarkably from 31 per cent in 1970 to 52 per cent by 1980. In the 1980s, the Malaysian financial sector underwent a radical transformation and deepening along with expansion in the economy. The upshot of this transformation was the emergence of a broader, deeper, more organized and better structured financial system.

Nevertheless, Malaysia has never completely and consistently liberalized its financial sector. In the past, the main components of reform policies have been liberalization of the interest rates, improvement of the regulatory and supervisory framework, and opening up of the domestic financial sector. The reform programs also appear to have been narrow in scope, where much of BNM's efforts have been focused on eliminating interest controls (Bascom, 1994). In addition, some of the liberalization measures were introduced as instruments to tackle certain problems in the economy during specific time periods. For example, Malaysia experienced an acceleration of capital account opening in the 1990s following the stock market booms. However, capital controls were put in place temporarily in 1994, and from 1998 to 2005, to manage exchange rate fluctuations. Furthermore, although measures have been introduced to enhance banking sector competition, restriction of foreign banks participation still prevails. Therefore, it appears that the financial sector policies adopted by Malaysia are not consistent, given that the liberalization measures taken did not represent a continuous and steady policy to liberalize the financial system (Hussein, 1994).

Quite apart from the financial liberalization policies pursued, a series of directed credit programs were implemented in 1975. These strong financial commitments were mainly made for the advancement of the indigenous Malaysians (Haggard, 2004). During that year, at least 50 per cent of total lending made by banks had to be advanced to the *bumiputra* community. The requirement was reduced to 20 per cent in the following year, and then adjusted upward to 30 per cent in 1996. The programs also include minimum lending to other priority sectors, including agriculture, manufacturing,

small and medium size enterprises, and to individuals for housing loans. These programs remain in force to-date.

In sum, it appears that repressionist measures, such as interest rate controls, banking sector restrictions, and directed credit programs, coexist with a structuralist policy of promoting the creation of more financial institutions (Yaakop, 1988).[27] These financial sector policies, liberalization or repression, and the development that follows, can have a significant impact on the relationship between financial development and economic growth. Consequently, the relationship of these two variables must be examined in the context of the financial environment.

3.6 Financial Structure

The financial system in Malaysia can be broadly classified into financial institutions and financial markets (Table 3.5). The former consists of the banking system and non-bank financial intermediaries, of which the banking system is the largest component in the financial system. The latter comprises money and foreign exchange markets, capital markets, derivatives markets and offshore markets.

The compositions of major financial intermediaries by assets in 2003 and 1970 for Malaysia are presented in Figures 3.3 and 3.4, respectively. As is evident, the financial system in Malaysia has grown rapidly over the past few decades. Total assets in the financial system increased from RM 11 billion at the end of 1970 to RM 1,564 billion at the end of 2003, an average annual growth rate of 16 per cent. The dominance of the banking sector in the Malaysian financial system is also evident. The total assets of banking institutions accounted for more than half of total assets at the end of 2003, of which commercial banks alone accounted for 40 per cent. Finance companies and merchant banks were relatively insignificant, accounting for 9 and 3 per cent, respectively. BNM constituted another 13 per cent of the total assets in the financial system. Among the major groups of non-bank financial institutions, the provident and pension funds and insurance funds remained the largest, accounting for more than 20 per cent of the financial system at the end of 2003. The share of commercial bank assets in the financial system has remained more or less unaltered over the last three decades. However, the relative importance of the central bank and the EPF has diminished over

[27] As discussed previously in Chapter 2, the structuralist view proposes that the emergence of more financial institutions and a greater variety of financial products and services will encourage financial intermediating activities and hence stimulate economic growth.

time due to the expansion of other financial intermediaries, such as finance companies, development financial institutions, and insurance funds.

Table 3.5: Structure of the Malaysian financial system

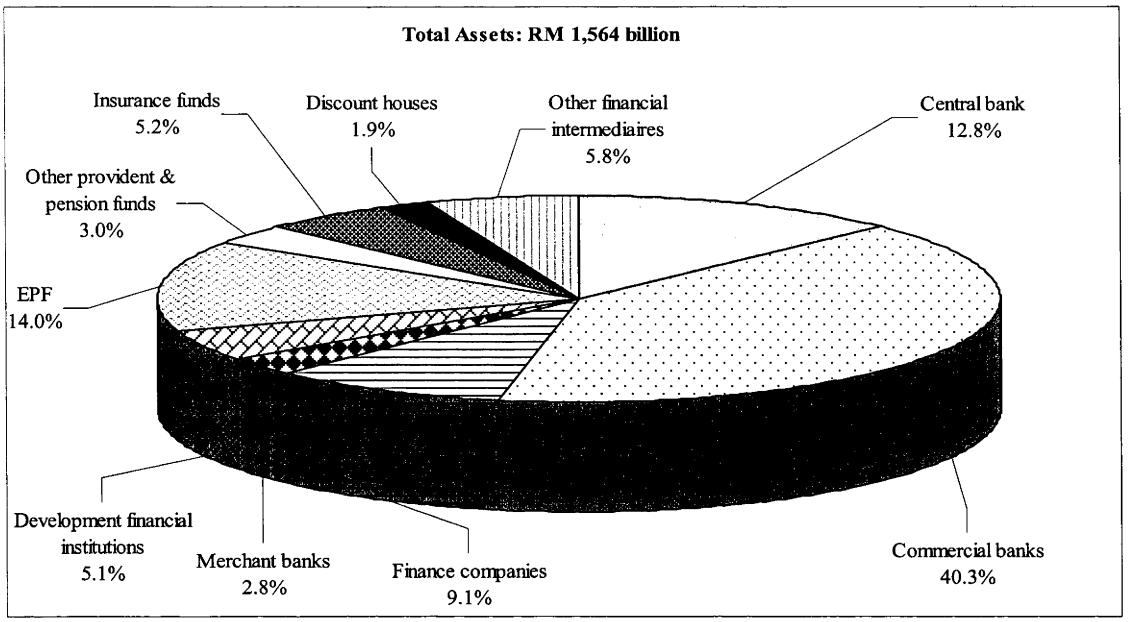
FINANCIAL INSTITUTIONS	FINANCIAL MARKETS
Banking System ▪ Bank Negara Malaysia ▪ Banking Institutions - Commercial Banks [1] - Finance Companies - Merchant Banks ▪ Others - Discount Houses - Representative Offices of Foreign Banks - Offshore Banks in Labuan International Offshore Financial Centre (IOFC)	Money and Foreign Exchange Markets ▪ Money Market ▪ Foreign Exchange Market Capital Markets ▪ Equity Market ▪ Bond Market - Public Debt Securities - Private Debt Securities
Non-Bank Financial Intermediaries ▪ Provident and Pension Funds ▪ Insurance Companies [2] ▪ Development Finance Institutions ▪ Saving Institutions - National Savings Bank - Co-operative Societies ▪ Other Non-Bank Financial Intermediaries - Unit Trusts - Pilgrims Fund Board - Housing Credit Institutions - Cagamas Berhad - Credit Guarantee Corporation - Leasing Companies - Factoring Companies - Venture Capital Companies	Derivatives Markets ▪ Commodity Futures ▪ KLSE CI Futures ▪ KLIBOR Futures Offshore Market ▪ Labuan International Offshore Financial Centre (IOFC)

Notes: 1) including Islamic Banks; 2) Including Takaful.
Source: BNM's The Central Bank and the Financial System in Malaysia: A Decade of Change 1989-1999 (1999, p. 67).

3.6.1 Banking system

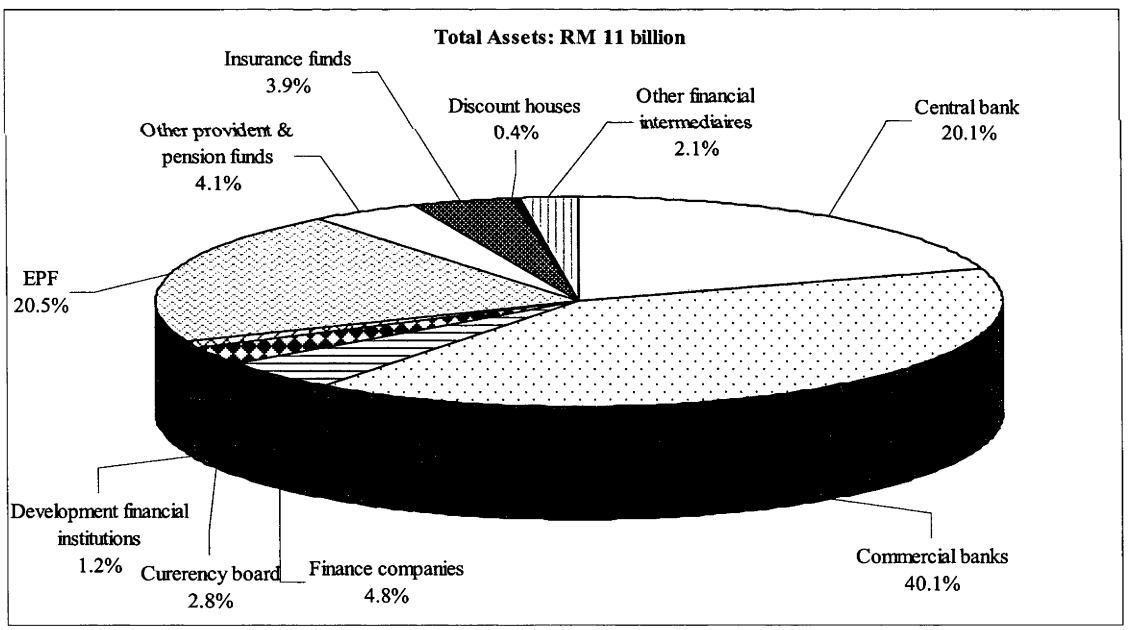
The banking system is the largest component of the financial system. It mainly includes commercial banks, finance companies and merchant banks, which are governed by BNM. Other smaller institutions include discount houses, the representative offices of foreign banks and offshore banks in Labuan. BNM is responsible for the regulation and supervision of the banking system. However, the offshore banks operating in the Labuan International Offshore Financial Centre come under the purview of the Labuan Offshore Financial Services Authority (LOFSA).

Figure 3.3: Asset distribution of financial intermediaries, 2003 (% share)



Notes: The Currency Board ceased function in November 1979. The first merchant bank was set up in 1970.
Source: BNM's Annual Report (2004).

Figure 3.4: Asset distribution of financial intermediaries, 1970 (% share)



Source: compiled from BNM's Money and Banking in Malaysia (1994).

Growth in the banking system over the last few decades has been remarkable. Total assets of the banking system rose from RM 7 billion in 1970 to RM 1,046 billion in 2003, an average annul growth rate of 16 per cent. It therefore appears that the increase in the size of the financial system over the last few decades is largely attributable to expansion in the banking system. This significant development in the banking system has been mainly achieved through the wider spread of bank branch

networks, the acceleration of credit growth, and the proliferation of banking products and services. Close supervision by BNM is also partly responsible for this development.

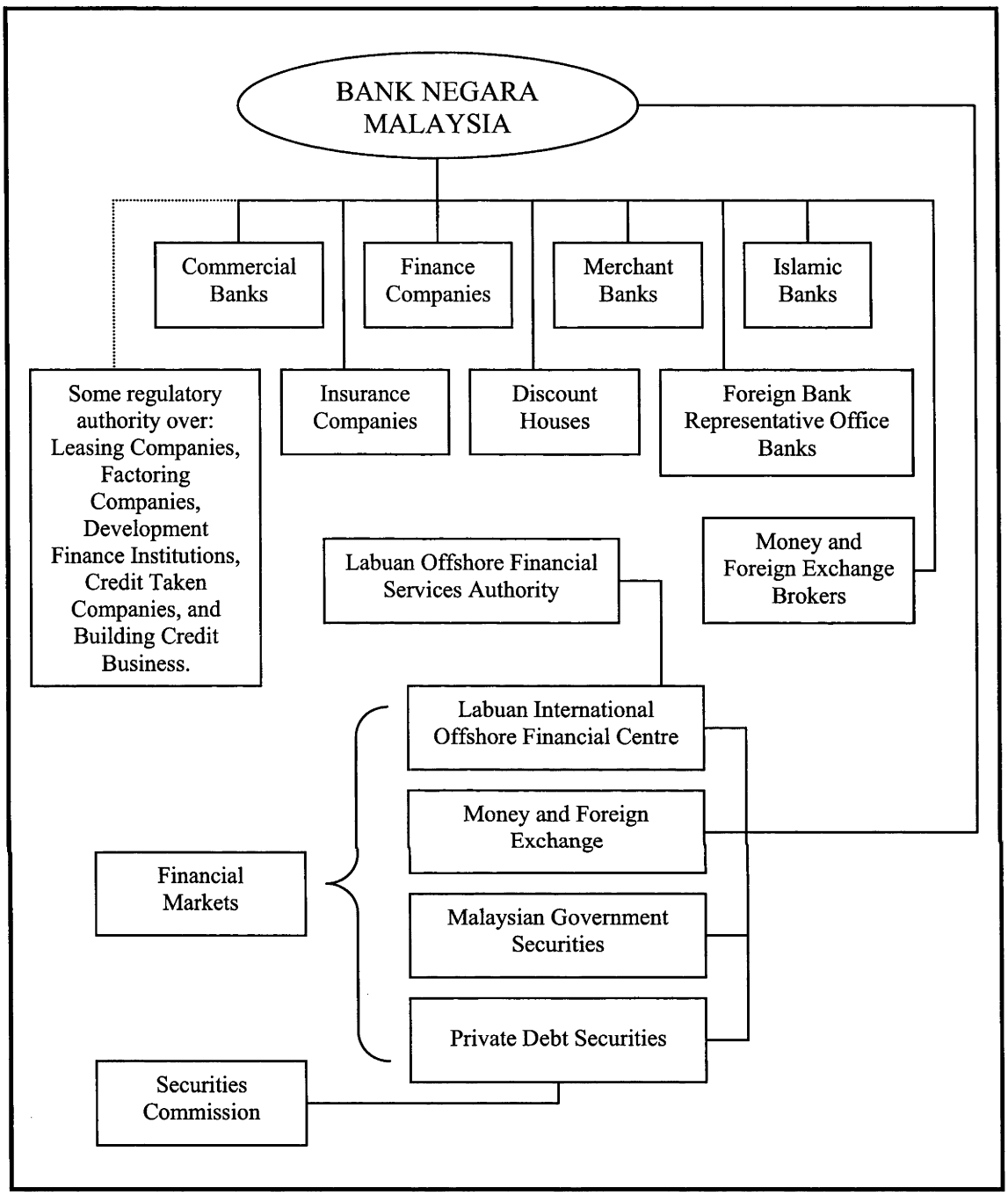
(a) Bank Negara Malaysia (BNM)

BNM was set up in 1959 to oversee the operation of the financial sector. It plays an important role in stimulating growth of the financial sector and stabilizing the economy with respect to curbing inflation and combating recession. It is also responsible for the formulation and implementation of monetary and credit policies to achieve financial and economic objectives. The progress of BNM can be assessed in terms of its assets, which increased from RM 151 million in 1959 to RM 12,994 million in 1980, and RM 201,258 million in 2003.

The key objectives of BNM are to: 1) issue currency and keep the reserves that safeguard its value; 2) act as a banker and financial adviser to government; 3) promote monetary stability and a sound financial structure; and 4) influence the credit situation to the advantage of Malaysia. These objectives are, by and large, complementary. Various legislative powers have been granted to regulate and supervise the financial system, allowing BNM to meet these objectives. These include the Central Bank of Malaysia Act 1958, the Islamic Banking Act 1983, the Banking and Financial Institutions Act 1989, the Essential (Protection of Depositors) Regulations 1986, and the Insurance Act 1996. This regulatory framework empowers BNM to play a fundamental role in overseeing the financial system in Malaysia, as illustrated in Figure 3.5 (BNM, 1999).

Malaysia has historically been able to maintain price stability, with an inflation rate averaging 3.3 per cent per annum over the last four decades. A wide range of monetary instruments, including open market operations, intervention in the inter-bank money market, issuance of BNM papers, and variations of the statutory reserve requirement have been used to achieve the objective of maintaining price stability (BNM, 1999). Price stability is a common goal pursued in most economies because it provides a platform towards sustained economic growth. Without price stability, the functions of resource mobilization and efficient allocation of resources would be retarded.

Figure 3.5: Financial institutions and markets regulated by BNM



Source: BNM's The Central Bank and the Financial System in Malaysia: A Decade of Change 1989-1999 (1999, p. 111).

A high level of central bank independence is generally associated with a central bank's ability to achieve the objective of price stability. In an influential study, Cukierman (1992) develops broad-based measures of central bank independence by using several legal proxies to characterize independence. A composite index is used to rank central banks by their degree of independence. Independence in this context is defined as a central bank's ability to achieve price stability, even at the expense of other short-term objectives. The degree of central bank independence is of significant interest

since it influences the rates of credit growth, inflation and fiscal conditions (Cukierman, Webb and Neyapti, 1992). The index of legal aspects of central bank independence for selected Asian countries is summarized in Table 3.6. In the compilation of the legal independence index for 68 developed and developing countries by Cukierman (1992), the ranking ranges from a minimum of 0.10 for Poland to a maximum of 0.68 for Switzerland during the period 1980-89. It is evident that Malaysia fares reasonably well in terms of central bank legal independence among Asian countries.

Table 3.6: Ranking of central banks by for selected Asian countries

Country	Overall legal independence	Ranking
Philippines	0.42	21
Malaysia	**0.34**	**33**
India	0.33	35
Indonesia	0.32	36
China	0.29	41
Singapore	0.27	47
Thailand	0.26	50
Korea	0.23	56
Pakistan	0.19	60
Japan	0.16	64

Source: compiled from Cukierman (1992, p. 381).
Notes: the range of overall legal independence is from zero (minimum independence) to one (maximum independence).

In terms of relations with international organizations, BNM has maintained an active role in international financial matters. BNM has established a tradition of regional cooperation through the Conference of Governors of South-East Asian Central Banks and the Conference of South-East Asia, New Zealand and Australia Central Banks and Monetary Authorities. BNM also maintains close working relationships with international financial institutions, such as the International Monetary Fund (IMF), The World Bank, the Asian Development Bank (ADB), the Islamic Development Bank (IDB), the World Trade Organization (WTO) and the Bank for International Settlements (BIS) (BNM, 1999).

(b) Banking Institutions

The banking industry mainly consists of three institutions: commercial banks, finance companies and merchant banks, with total assets of RM 8,480 million, RM 1,184 million and RM 123 million, respectively as of 1973. Until the 1970s, the banking sector was largely dominated by foreign banks (Aziz, 1984). Domestic banks have since become more influential. While commercial banks play a dominant role in the mobilization of saving, the roles of finance companies and merchant banks have become increasingly important over time due to the need for different financial services. In 2003, the total assets of these three major banking institutions recorded dramatic increases to RM 629,975 million, RM 141,911 million and RM 44,104 million, respectively, with an average annual growth rate of 16 per cent, 18 per cent and 26 per cent, respectively, since 1973.

Domestic commercial banks are key players in the banking system. They are the largest providers of funds with total loans amounting to more than RM 600 billion at the end of 2003. There were 23 commercial banks operating in the economy with a network of 1,684 branches (BNM, 2004). Finance companies are the second largest group of deposit-taking institutions. They mainly specialize in hire-purchase finance, leasing finance, housing loans, car loans, and secured personal loans. At the end of 1997, there were 39 finance companies with a total of 1,144 branches. However, following the undertaking of the merger program, the number of finance companies had shrunk significantly at the end of 2003 to only 11 companies with a total of 729 branches. Total loans issued by finance companies amounted to more than RM 100 billion at the end of 2003. As the Malaysian economy prospers, the country's banking needs have become more sophisticated. This has led to the emergence of merchant banks to complement the financial products and services provided by commercial banks and finance companies. They play an important role in providing corporate finance services, management consultancy services, and investment management advisory services. There were 10 merchant banks at the end of 2003, and all were domestically controlled.

(c) Islamic Banking

One distinctive feature of the Malaysian financial system is the presence and promotion of Islamic banking, which has become an increasingly important component of the financial structure. Malaysia is the pioneer of the dual banking system, where

Islamic banking operates in parallel with conventional banking. Malaysia is also the only country that has an Islamic inter-bank money market (Kader and Hashim, 2005).

1983 marked an important development in the evolution of the banking system in Malaysia with the introduction of Islamic Banking, following the enactment of the Islamic Banking Act 1983. During that year, Bank Islam Malaysia Berhad (BIMB) was established as the first Islamic bank under the legislation. It had a paid up capital of RM 80 million and a branch in Kuala Lumpur. The bank was created for Malaysian Muslims who wanted the services of a modern banking system but did not want to pay or receive interest, as forbidden by their religion.[28] As with other banking institutions, BIMB is supervised and regulated by BNM. BIMB carries out conventional banking services based on Islamic principles. For example, saving and current deposits are offered under the concept of Al-Wadiah (guaranteed custody) and investment deposits are offered based on the principle of Al-Mudharabah (profit sharing).

The bank was listed on the main board of the Kuala Lumpur Stock Exchange (KLSE) in 1992. In 1999, the total assets of the bank were RM 7.1 billion, with a network of 80 branches throughout the country. Islamic banking activity has experienced rapid growth in recent years. In 2003, the Islamic banking system was represented by 33 Islamic banking institutions, comprising two Islamic banks and 31 conventional banking institutions (nine commercial banks, four foreign banks, seven finance companies, four merchant banks and seven discount houses), offering a wide range of Islamic banking products and services under the Islamic Banking Scheme. It accounted for about 10 per cent of the total assets of the banking system in 2003, representing a 2.8 percentage point increase from 2000 (BNM, 2004). Rapid expansion of the Islamic banking sector has been fostered by the introduction of a variety of Islamic financial products, and the promotion of Kuala Lumpur as a regional Islamic financial centre.

With the launching of the Financial Sector Master Plan (FSMP) in 2001, in which clear strategies to develop the Islamic financial system have been set out, the government is committed to expanding the Islamic banking system. The plan explicitly sets a target for Islamic banking to capture at least 20 per cent of the banking market share by 2010 (Kader and Hashim, 2005). In addition, the Islamic Financial Services Board (IFSB) was established in 2002 to promote the development of Islamic banking.

[28] One of the key features of Islamic banking is the prohibition of paying or receiving interest, which is the backbone of conventional banking. Islamic banking operates under the principle of profit and loss sharing. Capital is not costless but rewarded based on profits obtained from other permissible banking business (Kader and Hashim, 2005).

Its objective was to develop international prudential regulatory standards in accordance with the distinct features and risks of Islamic financial institutions. Since its inception, the IFSB has attracted wide participation. At the end of 2003, the number of IFSB members had increased to 13 full members, three associate members and 20 observer members (BNM, 2004).

3.6.2 Non-bank financial intermediaries

Non-bank financial intermediaries include provident and pension funds, insurance companies, saving institutions, development finance institutions, unit trusts, Credit Guarantee Corporation, leasing companies, etc. Of these, provident and pension funds, and insurance companies are the largest intermediaries as measured by their asset bases. They are supervised by various government departments and agencies. The insurance companies are under the supervision of BNM.

The provident and pension funds are a group of financial intermediaries designed to provide members and their families with a measure of social security and welfare. The key provident and pension funds operating in Malaysia are the Employees Provident fund (EPF), the Social Security Organization (SOCSO), the Armed Forces Fund and the Teachers Provident Fund (Aziz, 1984). The EPF is the largest amongst the provident and pension funds in the country. It accounted for about 83 per cent of the total resources of provident and pension funds at the end of 2003 (BNM, 2004). The growth of other private provident funds and insurance funds has been rather limited due to the dominance of this forced saving scheme. This is because individuals are left with less savings after contributing to the EPF.

(a) The Employees Provident Fund (EPF)

The presence of the EPF marks an important feature of the Malaysian financial system. This statutory fund was established under the Employees' Provident Fund Ordinance 1951, with the objective of providing members with a retirement plan. Since its inception, the EPF has been a very powerful vehicle in mobilizing compulsory savings. It is important for the government to maintain an effective EPF, since the fund is instrumental in generating resources to finance public investment projects at low cost (Gillam, 1982; Tracy, 1995). Hence, such an institutional investor provides long-term funding, which is influential in ensuring the long-term success of Malaysia.

The EPF is a publicly managed pension fund that operates under a fully funded Pay-As-You-Go (PAYG) scheme with a defined contribution plan. Contributors get

back their contributions plus accumulated returns at the point of retirement. The pension benefits take the form of one lump sum payment or a series of periodic payments. The government does not contribute, unless it is an employer. Some partial withdrawals are allowed for education, housing and medical expenses, before contributors reach the retirement age of 55.

Under this scheme, both employees and employers are required to contribute to the provident fund to help provide for employees retirement benefits. In 1975, the statutory rate of contribution was raised from 10 per cent (5 per cent from the employer and 5 per cent from the employee) of the employees' monthly salary to 13 per cent (7 per cent from the employer and 6 per cent from the employee). In 1980, the rate was increased to 20 per cent (9 per cent from the employer and 11 per cent from the employee). Currently, the scheme requires a mandatory contribution of 12 per cent of an employee's income by the employer and 11 per cent by the employee.

The fund is managed by the Employees' Provident Fund Board. The investment policy of the EPF is determined by the EPF Board in accordance with the provisions of the EPF Ordinance 1951, the Trustee Act 1949 and the Trustee Investment Act 1965. Permission must be sought from the Ministry of Finance for investment overseas. Apart from the retirement benefits, members are permitted to withdraw a portion of their EPF contributions for the acquisition of housing, subject to certain conditions. The last few decades saw an upward trend in the dividend rate paid by the EPF prior to the Asian financial crisis. It increased steadily from 2.5 per cent in the 1950s to a high of 8.5 per cent per annum in the 1980s (Merican, 1992). However, after the crisis, the rate declined to 6 per cent in 2000, and more recently to just 4.5 per cent in 2003. Nevertheless, these returns were still generally higher than the 12-month fixed deposits rate of commercial banks.

The coverage of the program is extensive. Almost all formal sector employees are covered by the program, except for those on government pensions and those contributing to the Armed Force Provident Fund (Merican, 1992). As a result of the improvement in coverage and an increase in the labour force, the fund has grown significantly in size over the years. Its total accumulated contributions increased from RM 594 million in 1960 to RM 185,243 million in 2003, growing at an average annual rate of 14 per cent. Its importance is also reflected by the number of members, increasing from 1.1 million to 10.5 million during the same period (see Table 3.7). Its assets in the financial system rose from RM 2 billion in 1970 to RM 219 billion in 2003 (see Figures 3.3 and 3.4).

Table 3.7: The Employee Provident Fund (EPF)

Year	Amount contributed (RM million)	Total accumulated contributions (RM million)	No. of contributors (million)	Total Investment (At book value RM million)	Malaysian Government Securities, MGS (RM million)	% of MGS in total investment
1960	85	594	1.1	619	558	90.1
1970	207	2,149	2.1	2,218	2,062	93.0
1980	1,068	9,129	3.8	9,261	8,582	92.7
1990	4,139	46,179	5.9	45,642	36,129	79.2
2000	20,954	167,485	9.8	179,047	61,766	34.5
2003	22,532	185,243	10.5	222,209	84,678	38.1

Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

In many developed economies, savings in the private sector are channelled into private provident funds and insurance companies. Most of these funds are then invested in equities, and the balance in government and corporate bonds. However, in Malaysia, a substantial portion of private savings are formed by compulsory contributions to the EPF. These funds are invested mostly in government securities (Merican, 1992; Queisser, 1999). The EPF was required to hold more than 70 per cent of government securities, before the rule was relaxed in the 1990s, acting as a lender of the federal government. It has also been used as a non-inflationary tool to finance government budget deficits. However, as shown in Table 3.7 the share of total investment in government securities has decreased gradually over the years due largely to the government's effort in promoting private sector and reducing fiscal deficits. The greater emphasis on various market instruments, such as Negotiable Certificates of Deposit (NCD), fixed deposits, foreign securities, etc., has also contributed to this development.

(b) Insurance

One aspect of a country's financial system often neglected in discussion of finance and development is the element of risk and its effect on the economy. Insurance is not only a means for diversifying risks, it is also potentially an effective tool for mobilizing saving. Until the 1970s, the insurance industry was dominated by foreign

companies. Since then, domestic insurance companies took over the role and began to provide an important source of funds for development of the economy.

Total assets of life insurance funds increased from RM 111 million in 1962 to RM 60,195 million in 2003, representing an average annual growth rate of 13 per cent. The combined premium income of the life and general insurers registered an annual growth of 18 per cent over the period 1989-99 to reach RM 10,857 million. The insurance products offered have also become increasingly more sophisticated to serve the diversified needs of consumers (BNM, 1999). The last decade has also witnessed an impressive development of Islamic insurance business in Malaysia.

3.6.3 Money and foreign exchange markets

The money market provides an avenue to channel short-term funds with maturities usually less than 12 months. It provides liquid funds for market participants who face temporary shortages of funding and serves as an investment outlet for those with temporary surplus funds. The openness of BNM's policy since the 1980s has resulted in little intervention in the Malaysian money market (Lin and Chung, 1995). The money market instruments mainly include deposits and short-term securities (e.g., bankers acceptances, NCD, treasury bills, Cagamas notes, etc.). The key players in the money market are commercial banks, merchant banks, discount houses, and other eligible finance companies. Thus, development in the financial system and money market are closely related.

The foreign exchange market is a wholesale inter-bank market for the sale and purchase of foreign currencies. It provides a facility for the trading of foreign currencies, which can be conducted through the spot market, or the forward and swap markets. The key participants in the foreign exchange market are commercial banks and some designated merchant banks. The Kuala Lumpur Foreign Exchange market has long been dominated by transactions in US dollars against the Ringgit. However, in recent years there has been a significant increase in the share of Euro and Yen transactions against the US dollars (BNM, 2004).

3.6.4 Capital markets

Capital markets are the markets for longer-term financial assets. They include a primary securities market that offers the issues of government and corporate securities for sale, and a secondary securities market that offers the trading of securities.

(a) Stock market

Although the Malayan Stockbrokers' Association was formed in 1937, actual share trading was not done publicly until 1960 (Drake, 1969a). Capital market development in Malaysia was initiated in 1960, with trading in Kuala Lumpur of stocks and bonds that were also listed in Singapore (double listing). Stock exchange activities have operated in Malaya and Singapore since the late nineteenth century, facilitating the trading of shares for companies incorporated locally or abroad. In 1973, the combined stock exchange for Malaysia and Singapore was reconstituted as the Kuala Lumpur Stock Exchange (KLSE) and the Stock Exchange of Singapore (SES), respectively. Listed companies could continue to be traded on both markets if they wished. At the end of 1982, there were 261 firms listed in the KLSE with a total nominal paid-up capital of RM 9,177 million (Lee, 1986).

In 1989, all Malaysian companies were delisted from the SES. Following this, the "over-the-counter" market, Central Limit Order Book (CLOB) was established by the Singapore government to facilitate the trading of shares from Hong Kong, Thailand, Australia and Malaysia. In 1998, more than 100 Malaysian companies were traded on the SES on an unlisted basis through the CLOB computer-based trading system (Lau and Mclnish, 2002). However, the trading of CLOB was discontinued from September 1998, following the outbreak of the Asian financial crisis.

Malaysian policy makers have put much effort into developing the stock market to reduce reliance on the banking sector and diversify the sources of finance. Since the late 1980s, the stock market in Malaysia has undergone robust development and has gradually evolved to be one of the fastest growing markets in the region. During the period 1988-96, the KLSE experienced significant expansion with market capitalization rising from RM 98.7 billion in 1988 to RM 806.8 billion in 1996, before declining to RM 374.5 billion in 1998, following the Asian financial crisis. Nevertheless, the market rebounded to RM 640.3 billion in 2003. The number of companies listed on the KLSE increased from 295 to more than 900 over the period 1988-2003 (BNM, 2004).

Although the stock market was severely affected during the crisis, private enterprises benefited significantly from the availability of cheap finance through the issuance of initial public offerings and new shares. Funds raised in capital markets have increased steadily over the last few decades, reflecting a growing demand for long-term funds for both the public and private sectors (see Table 3.8). Funds can also be raised through the Kuala Lumpur Stock Exchange (KLSE) and the Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ), which are secondary

markets. The KLSE is the largest segment in capital markets whereas the MESDAQ is a separate market established in 1997 for small, high-growth potential and high-technology companies. The average annual funds raised from the stock market over the period 1971-2003 accounted for about 25 per cent of total funds sourced from capital markets. A majority of the funds raised in capital markets were used to finance private sector development. This is in line with the government's objective to promote the private sector as the key engine of growth.

Table 3.8: Average funds raised in capital markets (RM million)

Year	Public net issues of debt securities	Private new issues of shares/warrants	Private net issues of debt securities	Total
1971-80	1,323	91	8	1,422
1981-90	4,629	1,907	684	7,220
1991-96	1,490	8,834	15,624	25,949
1997-03	10,981	8,492	22,122	41,594
1971-03	4,404	4,013	7,743	16,160

Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

The comparative statistics presented in Table 3.9 highlight the position of Malaysia among the Asian countries. In terms of the extent of stock market development, which can be measured by stock market capitalization to GDP, Malaysia topped the ranking in 1996 before the Asian financial crisis. However, it is not clear whether this was a sign of strength or vulnerability. The stock market turnover ratio, which measures the liquidity of the stock markets, also shows that the Malaysian stock market performed favourably in comparison with other Asian stock markets in the same year.

Table 3.9: Comparative stock market indicators for selected Asian countries

Country/ Region	Stock market capitalization to GDP				Stock market turnover ratio			
	1980	1990	1996	2002	1980	1990	1996	2002
Malaysia	**40.7**	**99.7**	**264.7**	**128.8**	**25.8**	**24.7**	**65.0**	**22.6**
Southeast Asia								
Indonesia	0.1	4.5	34.9	16.5	18.6	77.2	40.3	45.4
Philippines	9.1	18.9	85.3	53.4	21.0	14.0	36.1	7.6
Singapore	-	95.8	162.5	125.0	-	57.4	28.5	50.8
Thailand	4.1	29.1	67.0	33.1	23.1	91.9	36.4	113.7
East Asia								
China	-	-	9.5	39.2	-	-	327.2	67.0
Hong Kong	107.0	107.2	241.0	302.1	11.7	42.8	44.1	43.2
Japan	29.8	121.2	72.3	55.2	50.2	43.3	36.8	71.4
South Korea	7.1	49.9	29.2	43.0	42.4	59.9	109.0	336.6
Taiwan	13.5	107.3	82.6	98.9	80.0	419.7	203.4	225.3
South Asia								
Bangladesh	-	1.3	7.2	2.4	-	1.4	24.6	57.4
India	3.4	10.1	32.5	23.5	46.3	66.8	76.4	164.9
Pakistan	3.1	6.7	17.4	12.3	-	8.7	59.1	345.8
Sri Lanka	-	8.2	14.0	9.1	-	5.9	6.9	21.2

Source: World Bank's Financial Structure Database
(Available at http://www.worldbank.org/research/projects/finstructure/database.htm)

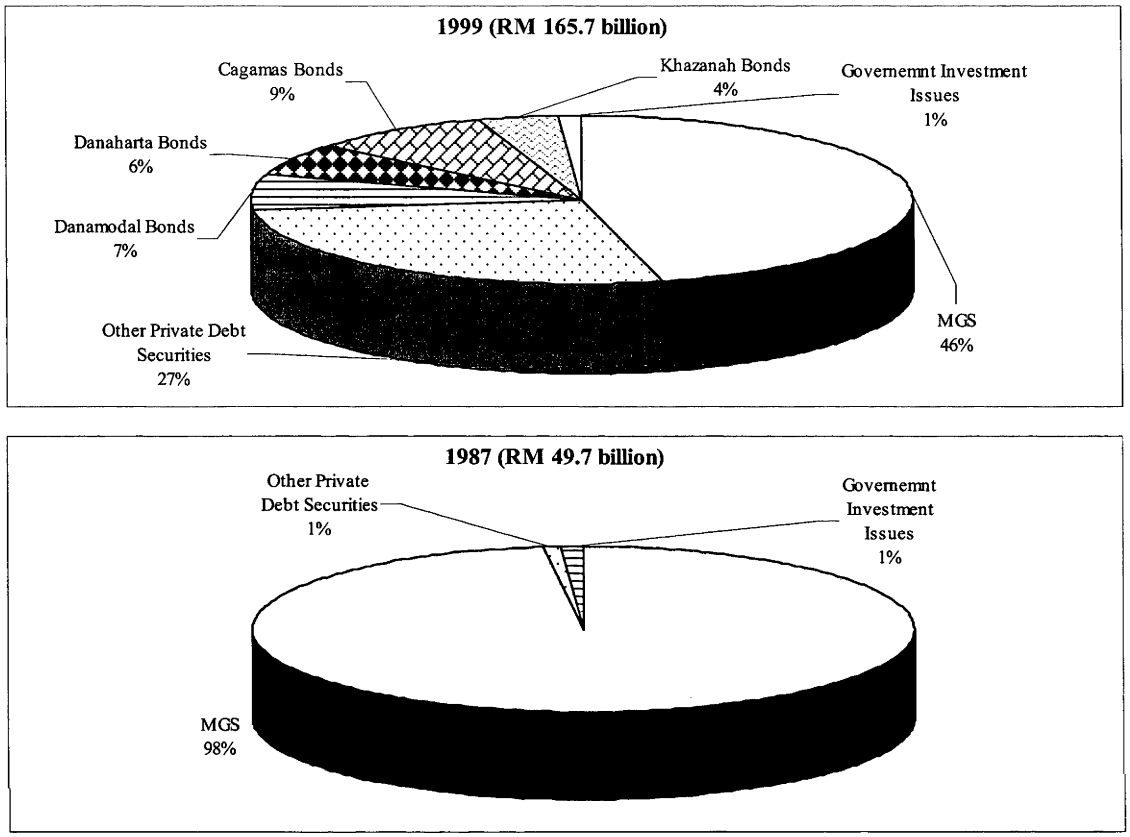
(b) Bond Market

In contrast to the stock market, the bond market provides an opportunity for the private and public sectors to raise funds through the issuance of private and public debt securities, respectively. It mainly comprises the government securities market and the private debt securities market. Listed bonds are traded in the KLSE whereas unlisted bonds are traded through the over-the-counter (OTC) market.

The bond market has traditionally been dominated by the government securities market. Until the second half of the 1980s, there was virtually no private debt securities market in Malaysia. The Malaysian government securities (MGS) market is the largest component of the bond market, as illustrated in Figure 3.6. In terms of the amount of funds raised, the size of this component is subject to the fiscal condition of the government. For instance, between 1980 and 1982 when budget deficits were large, the size of the government debt grew rapidly. Most MGS are held by social security

institutions and the banking system. The EPF, which is the largest pension saving funds in Malaysia, has been the principal investor in MGS (Lin and Chung, 1995).

Figure 3.6: Size and composition of the bond market



Source: BNM's The Central Bank and the Financial System in Malaysia: A Decade of Change 1989-1999 (1999, p. 338).

From the mid-1980s, the need to develop the market became quite clear, given the intention of the government to reduce public expenditure. Thus, in line with the policy to promote the private sector as the key engine of growth in the economy during the 1980s, the private debt securities market was set up to complement the government securities and equity market. The first move to achieve this objective was the setting up of Cagamas Berhad in 1986, the first national mortgage corporation. Its role was to buy housing loans and restructure these loans into fixed rate bonds (Yusof, 1992).

In addition, BNM published new guidelines on the issue of private debt securities (PDS) in 1988, aimed at encouraging firms to raise funds through this channel. Since the mid-1990s, the government has strongly encouraged private and public entities to issue bonds as an alternative to raise finance. During the post-crisis period, significant funds were raised by the public sector to finance expenditure on massive infrastructure projects to stimulate economic recovery (see Table 3.8). Another major step taken was the incorporation of the Rating Agency of Malaysia Berhad

(RAM) in 1990, providing the function of rating all issues of bonds and commercial papers, and disseminating timely information to all potential investors.

Although the bond market in Malaysia is still relatively immature and requires further development, its performance has been impressive in terms of the increase in asset base. The size of its market increased from RM 49.7 billion at the end of 1987 to RM 165.7 billion at the end of 1999, growing at an average annual rate of about 10 per cent (see Figure 3.6). The increasing size of the Islamic bond market has also contributed to development of the bond market. The PDS market has since emerged as an important segment in the bond market, accounting for 27 per cent of the total assets in 1999.

Table 3.10 shows the relative level of development of the bond markets in Asia. It is clear that the private bond market performs better than the public bond market in Malaysia. Development of the private bond market, as measured by the ratio of market capitalization to GDP, has increased from just 14.5 per cent in 1990 to 53.5 per cent in 2002. However, development of the public bond market seems to show a declining trend over the years, which is consistent with the analysis presented earlier. In terms of the level of development relative to other Asian countries, Malaysia fared relatively well in development of its private bond market. In 2002, Malaysia appeared to have had the highest level of private bond market development compared to other Asian countries. Turning to the public sector, Malaysia had the highest public bond market development in 1990 among Asian countries. However, this level of development has diminished over time. In 2002, the public bond market development was ahead of the Philippines, Thailand, China, Hong Kong, South Korea, Taiwan and India, but behind Singapore and Japan.

In sum, there seems to be less development in Malaysian capital markets in relation to other components in the financial system. Nevertheless, consistent with its national economic policies that view the financial sector as the facilitator of economic growth, the Malaysian government is committed to providing the necessary support for creation of an efficient capital market in order to foster a favourable investment climate for both domestic entrepreneurs and foreign investors. This was reflected in the 10-year Capital Market Master Plan (CMP) published in February 2001. The key objectives of the Plan were to improve liquidity, ease fund raising, reduce transaction costs, and develop a broader stock market and bond market (BNM, 2004).

Table 3.10: Comparative bond market indicators for selected Asian countries

Country/ Region	Private bond market capitalization to GDP (%)			Public bond market capitalization to GDP (%)		
	1990	1996	2002	1990	1996	2002
Malaysia	**14.5**	**36.2**	**53.5**	**55.3**	**31.2**	**35.0**
Southeast Asia						
Philippines	-	-	0.1	22.1	32.8	26.7
Singapore	15.7	10.7	23.5	12.2	15.1	35.5
Thailand	6.5	8.9	14.3	3.2	0.7	18.7
East Asia						
China	4.7	3.8	9.9	3.9	5.6	17.6
Hong Kong	0.3	12.2	18.4	1.3	6.2	9.2
Japan	40.1	45.2	46.3	45.4	52.1	102.9
South Korea	26.3	34.3	46.0	8.1	7.7	15.9
Taiwan	14.0	19.6	25.3	3.0	12.0	22.0
South Asia						
India	0.3	1.1	0.4	19.6	18.7	27.8

Source: World Bank's Financial Structure Database
(Available at http://www.worldbank.org/research/projects/finstructure/database.htm)

3.6.5 Derivatives markets

Derivatives include forwards, futures, options and swaps. The trading of derivatives in Malaysia began with the establishment of the Kuala Lumpur Commodity Exchange (KLCE) in 1980. In 1995, financial futures emerged in the market following the introduction of the Kuala Lumpur Stock Exchange Composite Index Futures (FKLI) on the Kuala Lumpur Options and Financial Futures Exchange (KLOFFE), and the 3-month Kuala Lumpur Inter-bank Offered Rate Futures on the Commodity and Monetary Exchange (COMMEX) in 1996. Although KLOFFE and COMMEX are allowed to operate on a self-regulatory basis, these markets are supervised by the Securities Commission, which was set-up in 1993 as the market watchdog to oversee the regulation and supervision of the securities industry (Hussein, 1994).

3.6.6 Offshore financial market

The offshore financial market in Malaysia was set up following the establishment of the Labuan International Offshore Financial Centre (IOFC) in 1990, with the aim of promoting Malaysia as a regional financial centre. The Labuan IOFC is regulated under the Labuan Financial Services Authority Act 1996. It is an integrated

financial offshore centre, which seeks to provide a wide range of offshore financial products and services to customers worldwide, particularly those in Asia. These include banking services, insurance activities, trust business, capital market activities, Islamic finance, etc. At the end of 1999, more than 2,100 offshore and supporting companies had been set up. There were 63 offshore banks, 50 insurance related companies, 20 trust companies, seven offshore leasing companies, and six fund managers operating in Labuan (BNM, 1999).

3.6.7 Bank-based or market-based?

Financial systems can be broadly classified into bank-dominated (German-Japanese model) and capital market-dominated systems (Anglo-Saxon model).[29] One of the key features of the Malaysian financial system is the presence of a large number of small and medium sized firms. In most private firms, families still retain significant control of management, which is a phenomenon that is not very common in an advanced financial system (Claessens, Djankov and Lang, 1999).

Another feature is the limited development in the Malaysian capital markets over the last 30 years. A majority of the companies in Malaysia are not listed and hence the more plausible source of finance is from banks rather than from financial markets. The market concentration ratio is rather high for Malaysia, compared to other more advanced financial markets, as market capitalization is highly concentrated in the hands of the ten largest firms. As Kohsaka (2004) maintains, development of the financial systems in the East Asian economies (including Malaysia) has mainly been supported by financial intermediation through commercial banks and other financial intermediaries rather than by bonds and equities through capital markets. Although the ratio of stock market capitalization to GDP has been relatively high over the years (see Table 3.9), the composition diagram illustrated in Figure 3.7 clearly highlights that a majority of funds raised by the private sector are from the banking sector. On these grounds, the Malaysian financial system can be described as a bank-based system rather than a capital market-based system.

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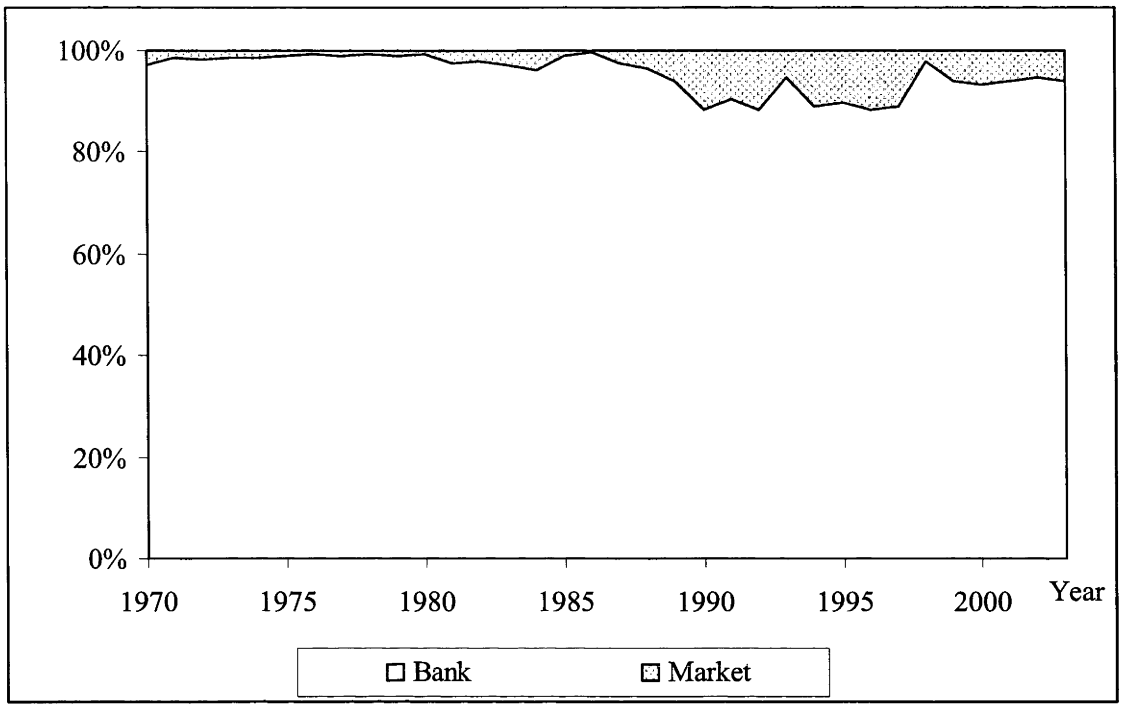
[29] Bank-based or market-based systems may have different impacts on economic growth. A bank-based financial system tends to promote long term economic growth as banks tend to offer longer term loans to entrepreneurs. In contrast, a market-based financial system is more likely to have short-term effects as firms are primarily concerned with immediate performance.

Figure 3.7: Composition of funds raised by the private sector, 1970-2003



Notes: "Bank" = domestic bank lending to the private sector; "Market" = new issues of shares and warrants plus new issues of debt securities.
Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

3.7 Trends and Patterns of Savings

Economic growth is sustainable only if domestic resources can be mobilized efficiently and transformed into productive uses. Therefore, mobilization of saving is an important vehicle for capital formation, and hence economic development. Historically, Malaysia has been able to maintain a high saving record. Over the last four decades, the country has saved an average of 25.5 per cent of GDP. In 2003, Malaysia became one of the top savers in the world, after China and Singapore. This impressive saving record is an important contributing factor to the high growth rates achieved by Malaysia.

3.7.1 The role of government

The government has consistently promoted high saving as part of national development policy. Over the past four decades, various measures have been taken to promote saving, as outlined below:

1) The Insurance Act enacted in 1963 subjected all life insurance companies to a set of comprehensive legislation, aimed at enhancing the sound operation of insurance business. Under this legislation, insurance companies were required to back up their liabilities with a minimum of 55 per cent (Lee, 1971). Since then, investment in life

insurance products has largely been encouraged by the government as a method to save for retirement. In 2003, the annual premium income was equal to 5.1 per cent of GNP, signifying the effectiveness of the government efforts (BNM, 2004).

2) Malaysia has a relatively well-developed banking system, comprising commercial banks, finance companies, merchant banks, and other smaller banking institutions. Of these, commercial banks are the most crucial deposit-taking institutions. These banking institutions have served as an effective vehicle for deposit mobilization in the past few decades. Another important development during this period was the establishment of Post Office Savings Banks (POSB) in 1948. The Bank was later restructured and renamed as the National Saving Banks in 1974. POSB was set up to provide adequate banking facilities and promote saving, particularly among small savers in both urban and rural areas. A large number of bank branches ensures basic banking facilities reach a majority of the general public. In addition, the Agriculture Bank of Malaysia was set up in 1969 to provide credit to the rural sector. Its ability in mobilizing resources in rural areas has led to substantial credit expansion in the rural areas and enabled agricultural activities to be carried out effectively.

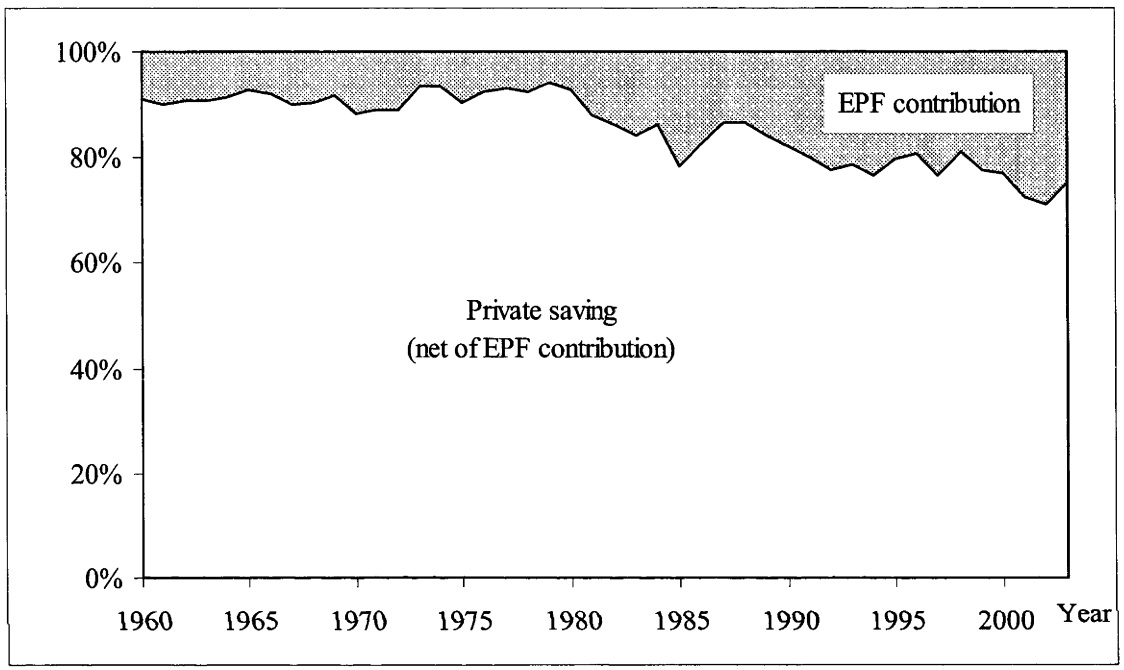
3) Promoting saving by way of education has always been a very effective tool. In the past, various *ad hoc* saving schemes, such as the *Amanah Saham National* in 1979, the *Amanah Saham Bumiputra* in 1991, the National Saving Campaign in 1996, and the *Amanah Saham Vision 2020* in 1996, have been provided by the government with the key objective of expanding saving. The implementation of these schemes has promoted the virtues of thrift and the saving habit in the Malaysian community. This may have largely mobilized domestic private saving in the economy.

4) With respect to the institutional setting, the mandatory contribution of the labour force to the Employees Provident Funds (EPF) is an important factor in accounting for this high saving record. The EPF, set up in 1951 to serve as a nation-wide old age retirement scheme for employees, is the largest compulsory saving institution operating in Malaysia. The resources of the EPF have mostly been invested within Malaysia, particularly in the public sector. This provides substantial resources to finance economic development. Its importance is reflected by the size of the annual EPF contribution, which made up 6.1 per cent of GNP in 2003 (BNM, 2004).

Given the above, it appears that one common explanation for the high saving rate observed in Malaysia has been the presence of an effective forced saving policy in the form of a broad based EPF scheme. Thus, in order to shed some light on the behaviour of private saving, the separation of provident fund contributions from private

saving is necessary, since the proportion of compulsory saving is determined by government policy. As shown in Figure 3.8, the share of EPF contribution in private saving has persistently increased over time. Thus, the saving function in Chapter 6 is estimated for two saving variables, i.e., private saving and private saving net of annual EPF contributions.

Figure 3.8: Composition of private saving and EPF



Notes: Public saving refers to total public sector current surpluses/deficits, which can be defined as government revenue minus operating expenditure, plus non-financial public enterprise surplus. Private saving equals to gross national saving minus public saving.
Sources: compiled from BNM's Money and Banking (1994), BNM's Annual Report (various issues), BNM's Monthly Statistical Bulletin (various issues), and Ministry of Finance Malaysia's Economic Reports (various issues).

3.7.2 Composition of saving

From Table 3.11, it can be seen that Malaysia's GDP growth was mainly attributable to the increase in saving from the private sector, most notably in the 1970s and the early 1990s. However, the contribution of saving to output expansion from the private sector declined dramatically in the 1980s, mainly due to the global economic recession in 1985, when corporate earnings were curtailed significantly. During this period, the shrinkage in private saving was compensated by a corresponding increase in public saving. However, saving from the pubic sector plunged in 1998 following the Asian financial crisis.

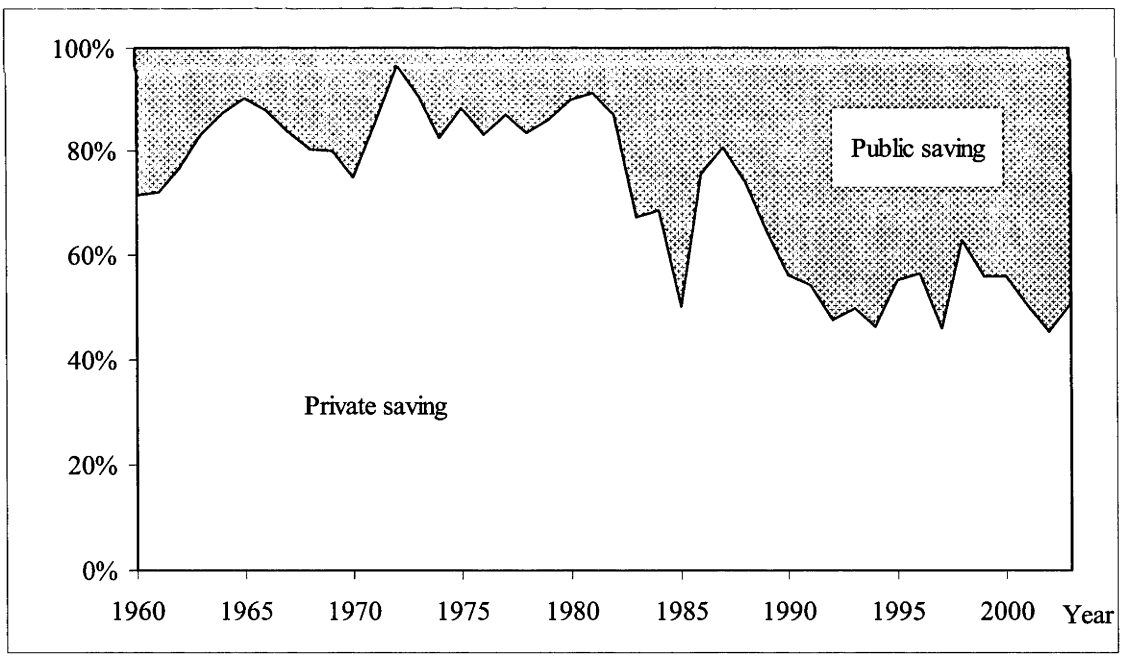
Table 3.11: Contribution of saving to GDP increment (%)

	1961-70	1971-80	1981-90	1991-96	1997-03
Private saving	13.2	29.6	9.7	27.0	18.5
Public saving	3.7	3.1	22.4	19.5	8.8
Total	16.8	32.7	32.2	46.5	27.3

Sources: compiled from BNM's Money and Banking (1994), BNM's Annual Report (various issues), BNM's Monthly Statistical Bulletin (various issues), and Ministry of Finance Malaysia's Economic Reports (various issues).

Figure 3.9 shows the relative contribution of private and public saving to total domestic saving. Private saving accounted for more than three quarters of total domestic saving in the 1960s. This share declined steadily over the next three decades to about 50 per cent by 2003. Since the mid-1980s, the relative contribution of public saving to total domestic saving has increased persistently.

Figure 3.9: Composition of saving in Malaysia: 1960-2003



Sources: compiled from BNM's Money and Banking (1994), BNM's Annual Report (various issues), BNM's Monthly Statistical Bulletin (various issues), and Ministry of Finance Malaysia's Economic Reports (various issues).

This pattern of change highlights the importance of treating private and public saving separately in examining the determinants of domestic saving, since the analysis of total saving *per se* may be subject to aggregation bias. However, as Newlyn (1977)

pointed out, there is no theory available for public saving given that the government can determine its own income. The public saving decision is therefore part of the tax policy, which depends on the country's capacity to tax and other policy factors that hardly change over time. The lack of an established theory for public saving prompts the assumption that public saving is exogenous. Hence, the analysis of saving behaviour in Chapter 6 is mainly concerned with the determinants of private saving. Unfortunately, a further segregation of private saving into household saving and corporate saving is not possible due to the lack of sufficient time series data.

3.8 Trends and Patterns of Investment

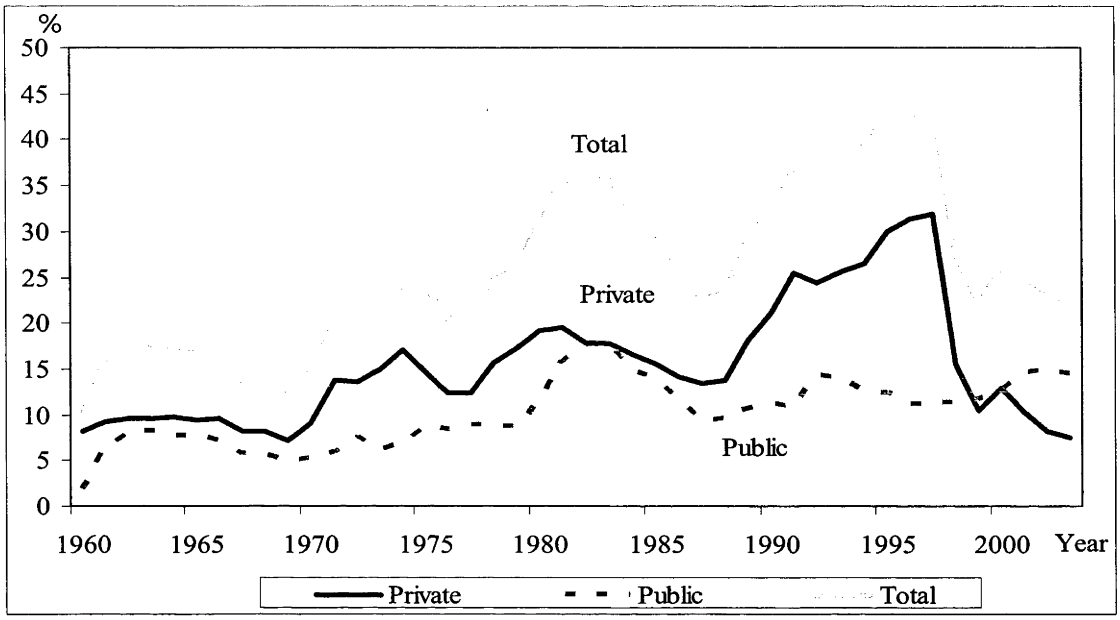
3.8.1 Policy context and investment patterns

This section describes investment behaviour in Malaysia over the period 1960-2003. After achieving independence in 1957, the country inherited a relatively well-developed infrastructure and an efficient administrative system from the British government, which appeared to be conducive for capital formation. Given that capital formation is an important driver for sustained economic development, the Malaysian government enacted the Pioneer Industries Ordinance of 1958 to stimulate private investment. Malaysia started 1960 with a moderate level of both private and public investment, where the shares of private and public investment in GDP were 8.2 per cent and 1.9 per cent, respectively (see Figure 3.10). However, this total investment rate of 10.1 per cent was much lower than the average of lower and middle-income countries, which stood at 21.3 per cent in the same year. The total investment rate increased rapidly to about 17 per cent by the mid-1960s, prior to declining in the late 1960s due to the higher macroeconomic uncertainty triggered by the racial riots of 1969.

The government attributed the poor performance of investment activities to inadequacies of the 1958 Ordinance, and many of the weaknesses were corrected in the Investment Incentives Act of 1968. The 1970s saw a massive increase in capital formation, reaching a peak in the early 1980s. Investment rates were curtailed significantly when the global economic recession hit the country in 1985. Confronted with huge government budget deficits and current account deficits following the recession, as well as decreasing domestic and foreign investment, Malaysia began to

grant attractive investment incentives to attract local and foreign investors through the Promotion of Investment Act 1986.[30]

Figure 3.10: Trends of private and public investment rates, 1960-2003



Notes: Private investment rate is gross private fixed capital formation as a percentage of GDP. Public investment rate is gross public fixed capital formation as a percentage of GDP. The total investment rate is the sum of private and public investment rates.
Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

As Figure 3.10 makes clear, the total investment rate, which consists of private and public investment rates, shows an overall increasing trend over the period 1960-84. The series declines sharply following the global economic recession in 1985. After the recession, private and public investment rates show a rather different pattern of development. Private investment rate showed an upward swing in 1987, and increased at a rapid pace for a few years whereas little change was observed in public investment rate during the same period. Malaysia's impressive saving record has enabled the total investment rate to increase gradually over the years, reaching a peak in 1997, before the onset of the Asian financial crisis.

Notwithstanding these past strong records, the private investment rate declined sharply in the aftermath of the crisis. This sharp contraction in private investment resulted in a downward trend in the total investment rate. Since then, capital formation has been mainly supported by public investment, and it is not clear whether this will be

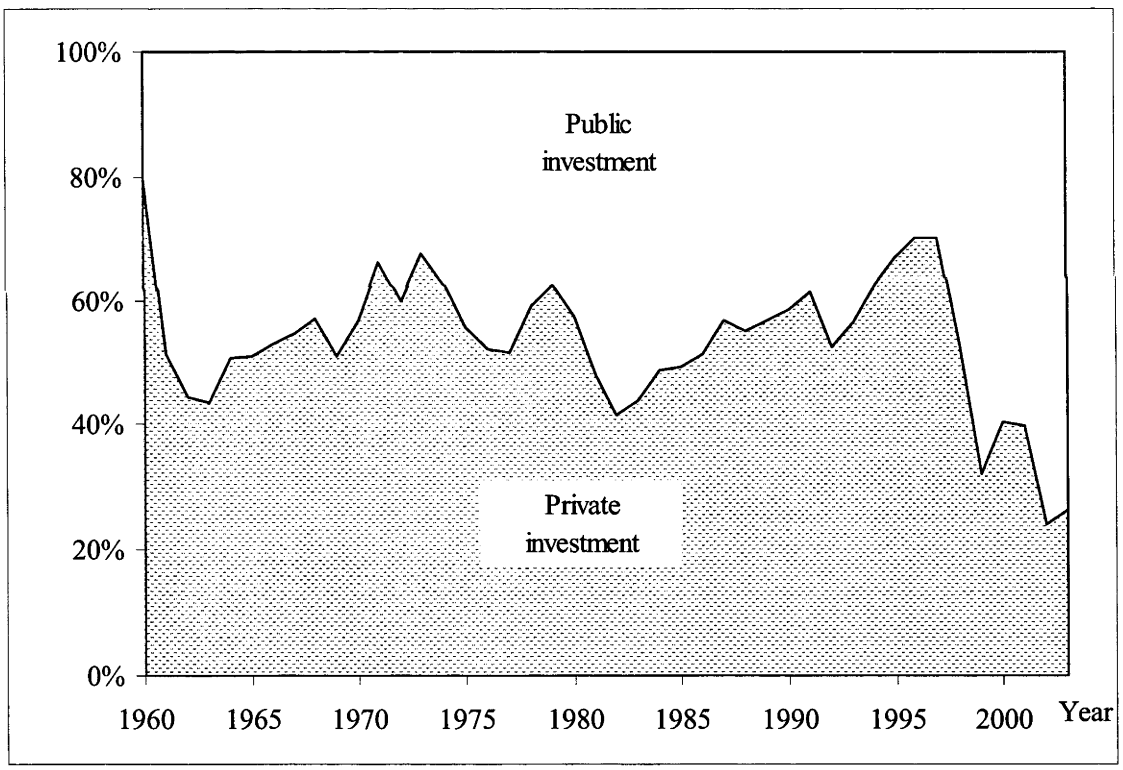
[30] The types of investment incentives given include pioneer status, investment tax allowance, abatement of adjusted income, abatement of adjustment income for exports, export allowance, and double deductions for certain types of expenses. For more details, see Yong (1988) and Boadway, Chua and Flatters (1995).

sustainable in the long-run. Hence, understanding the patterns and behaviour of private investment is of direct interest to policy makers aimed at to raising output in the long-run.

3.8.2 Composition of investment

Figure 3.11 reflects the shares of private and public investment in total investment. Private investment accounted for more than 80 per cent of the total in 1960. This share shows a declining trend over the next two decades before picking up again in the 1980s. On the whole, private investment dominated total investment in Malaysia prior to the 1997-98 crisis. However, as would be expected, the share of private investment declined sharply after the crisis.

Figure 3.11: Composition of total investment in Malaysia, 1960-2003



Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

From the above analysis, it appears that the behaviour of investment in Malaysia is predominantly influenced by private, rather than by public investment (except when the latter is counter-cyclical). This suggests that in order to avoid aggregation bias, a decomposition of aggregate investment is necessary. It is important to focus on private investment in order to understand the behaviour of investment, given that public

investment is primarily driven by policy objectives, which are empirically difficult to quantify and estimate.

3.8.3 Foreign direct investment

FDI constitutes an important component of total investment, given that Malaysia is one of the most successful developing countries in attracting a large amount of FDI inflows. According to the inward FDI potential index (a measure of the attractiveness of the host economy to foreign investors) published by UNCTAD (2004) in 2003, Malaysia was ranked first among the Asian developing countries. The importance of FDI to domestic economic development is therefore undeniable. As pointed out by Athukorala and Menon (1995), FDI is an important contributing factor to Malaysia's growth-led industrialization.

Policy reforms, including the introduction of the Investment Incentives Act 1968, the establishment of free trade zones in the early 1970s, and the provision of export incentives, together with the acceleration of open policy in the late 1980s, all led to a surge in FDI. Apart from these policy factors, it is generally believed sound macroeconomic management, sustained economic growth, relatively low set up costs, political stability, a sufficiently trained labour force, and a well-functioning financial system make Malaysia an attractive prospect for FDI.

Notwithstanding the importance of FDI for Malaysia, an examination of the determinants of FDI is not straight-forward. This is because FDI depends upon a quite different set of determinants from that of private investment.[31] For instance, the cost of capital for FDI may depend on the cost of raising funds in the source country, rather than the host country. Foreign investors are likely to bring in their own sources of funding rather than raise funds in the host country. Given the above considerations and the objective of this thesis, the examination of what determines FDI in Malaysia is beyond the scope of this study and is therefore not pursued here.[32]

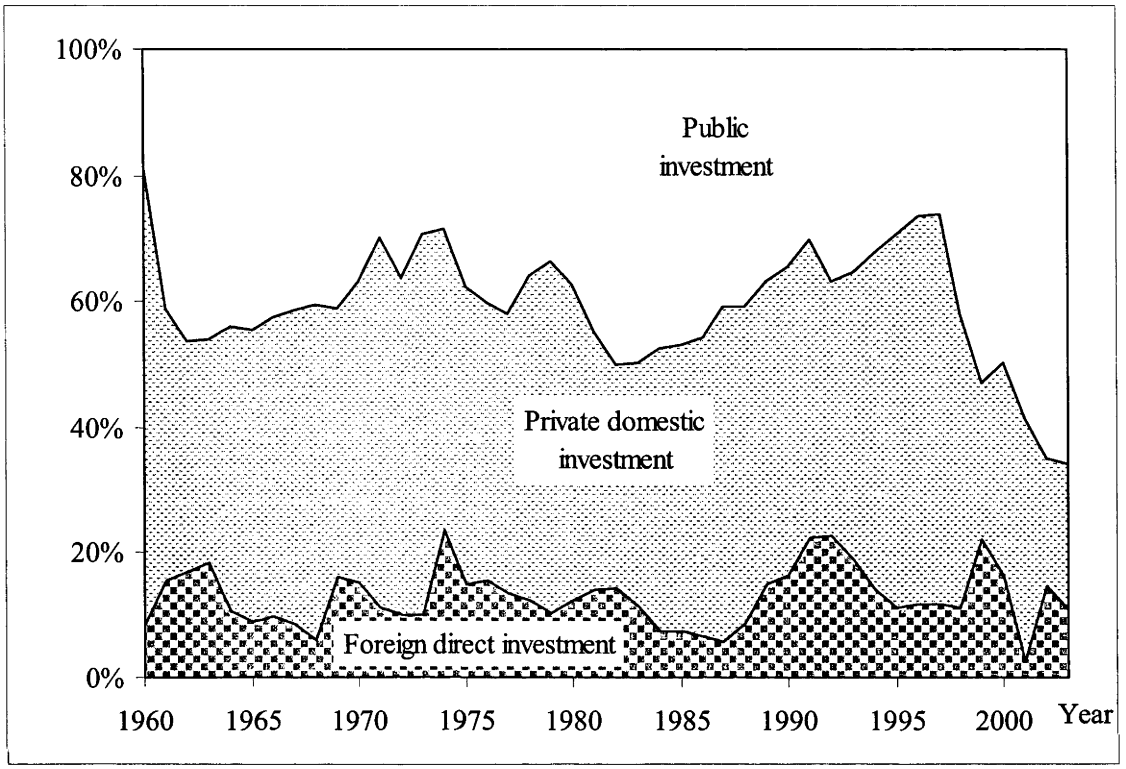
As depicted in Figure 3.12, the share of FDI in total gross domestic capital formation has not changed significantly over the period 1960-2003, averaging at about 13 per cent per year. Therefore, the inclusion of FDI in the estimation of private investment is unlikely to make much difference to the results. However, keeping the caveat in mind that FDI depends on a set of factors quite different from those captured in the standard private investment function, it is necessary to estimate for both private

[31] See Blonigen (2005) for a review.

[32] For more discussion on FDI in Malaysia, see Ariff (1991).

investment and private domestic investment, where the latter is defined as private investment net of FDI. An econometric analysis of the determinants for private investment and private domestic investment is provided in Chapter 7.

Figure 3.12: The composition of investment, 1960-2003



Sources: compiled from BNM's Money and Banking (1994) and BNM's Monthly Statistical Bulletin (various issues).

3.9 The Saving-Investment Dynamics

This section looks at the development experience of Malaysia in managing the saving-investment gap to achieve sustained economic growth. Table 3.12 and Figure 3.13 show how the average rates of saving and investment interacted with the current account balance over the period 1961-2003. Gross domestic saving (S), gross domestic investment (I), and current account balance (CA) are expressed as a ratio of GDP (Y), denoted as S/Y, I/Y and CA/Y, respectively. The current account balance equals gross domestic saving minus gross domestic investment ($CA = S - I$).[33]

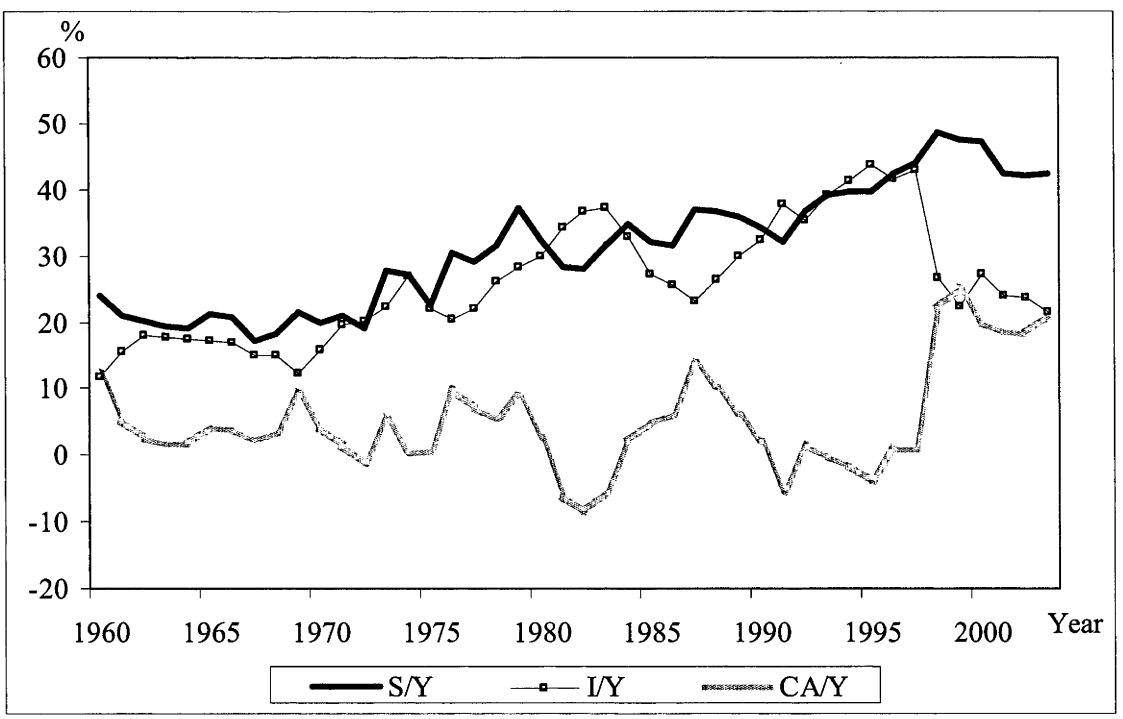
[33] An econometric analysis of the saving and investment relationship is provided in Chapter 8.

Table 3.12: Saving, investment, and current account balance (% of GDP)

Period	*S/Y*	*I/Y*	*CA/Y*
1961-65	20.1	17.1	3.1
1966-70	19.5	14.9	4.6
1971-75	23.4	22.1	1.3
1976-80	32.2	25.4	6.7
1981-85	31.0	33.6	-2.7
1986-90	35.0	27.4	7.6
1991-96	38.3	39.8	-1.5
1997-03	44.9	26.9	17.9
1961-03	31.4	26.3	5.1

Sources: compiled from BNM's Money and Banking (1994), BNM's Monthly Statistical Bulletin (various issues) and Ministry of Finance Malaysia's Economic Reports (various issues).

Figure 3.13: Trends of saving, investment and current account balance (% of GDP)



Sources: compiled from BNM's Money and Banking (1994), BNM's Monthly Statistical Bulletin (various issues), and Ministry of Finance Malaysia's Economic Reports (various issues).

It is evident that Malaysia has been very successful in mobilizing saving. The average annual share of gross domestic saving to GDP rose from just 20.1 per cent in 1961-65 to 44.9 per cent in 1997-03. Gross domestic investment was primarily funded by domestic saving (which includes household saving, corporate saving and government saving) and was supplemented by foreign saving. That is, when investment was greater than saving, the resource gap was financed by current account deficits. Its average annual rate increased from 17.1 per cent of GDP in 1961-65 to a record high of 39.8 per cent of GDP in 1991-96, before the onset of the 1997-98 Asian financial crisis.

Although investment increased rapidly during the period 1961-80, Malaysia was able to finance much of the investment projects without significant recourse to external financing. Consequently, there were no large current account deficits recorded in the balance of payments. However, this pattern of development was not continued in the 1980s. During the period 1981-85, a current account deficit averaging 2.7 per cent of GDP was recorded. This historically high level of current account deficit was mainly due to the counter-cyclical pump-priming efforts of the government, following deterioration in the prices of several major export commodities. The government initiated a "big push" program that contributed to a significant rise in investment. As a result, the investment to GDP ratio rose from 14.9 per cent during the period 1966-70 to a high level of 33.6 per cent during the period 1981-85. With increasing commodity prices in the next few years, 1986-90 saw an improvement in the saving-investment gap. This saving-investment gap narrowed further through restraining fiscal spending by government. Following this structural adjustment policy, excessive consumer spending was curbed, resulting in a higher saving rate.

With rapid expansion in investment activities, the resource gap emerged once again during the period 1991-96, when some investment activities were financed by foreign capital. However, gross domestic investment was severely affected in the wake of the Asian financial crisis, and has remained sluggish. Hence, the post-crisis period saw a huge current account surplus.

In sum, it appears that the high saving rate recorded in Malaysia throughout the last four decades has enabled investment activities to be carried out without much reliance on foreign capital, although inflows of FDI have been high in Malaysia. In most periods, domestic saving has been sufficient to fund expansion in investment activities. Thus, the current account has been in surplus most of the time.

A further breakdown of saving and investment rates into public and private components shows that public saving was insufficient to support public investment prior

to the 1990s (see Table 3.13). The public sector became a net-saver from the 1990s onwards due to a significant increase in public saving. At the same time, the government actively promoted the private sector as the main driver of economic development. This was augmented by the introduction of the Promotion of Investment Act 1986 (BNM, 1999). In contrast, the private sector was a net-saver during the period 1961-90. However, this surplus in private saving turned negative during the period 1991-95 when there was a massive increase in private capital formation. Following a fall in private investment from 1996, a surplus in the private sector was again recorded.

Table 3.13: Average savings and investment gap (% of GDP), 1961-2003

Period	Public saving	Public investment	Surplus/ Deficit	Private saving	Private investment	Surplus/ Deficit
1961-65	0.029	0.076	-0.047	0.132	0.095	0.037
1966-70	0.030	0.058	-0.027	0.133	0.085	0.048
1971-75	0.022	0.071	-0.049	0.167	0.148	0.019
1976-80	0.039	0.092	-0.053	0.239	0.153	0.086
1981-85	0.070	0.160	-0.090	0.184	0.174	0.010
1986-90	0.086	0.104	-0.019	0.202	0.161	0.041
1991-95	0.152	0.128	0.024	0.156	0.264	-0.108
1996-00	0.167	0.116	0.051	0.209	0.204	0.005
2001-03	0.167	0.137	0.030	0.180	0.099	0.082

Sources: compiled from BNM's Money and Banking (1994), BNM's Annual Report (various issues), BNM's Monthly Statistical Bulletin (various issues), and Ministry of Finance Malaysia's Economic Reports (various issues)

3.10 Conclusions

Malaysia's economic performance in the post-independence era was relatively impressive by developing country standards. For the period 1961-96, real GDP growth rate averaged 7.3 per cent. Changes in the economic environment have given rise to different needs for financial products and services. Together with the financial liberalization policies undertaken, these changes have led to the emergence of a much more sophisticated financial system. Today, the financial system plays a more important role in mobilizing and channelling resources effectively to productive sectors rather than merely serving the needs of trade financing. However, due to limited development in the capital markets, the Malaysian financial system is predominantly bank-based.

Rapid economic growth and on-going deepening in the financial sector suggest financial development and economic growth in Malaysia may be strongly related.

CHAPTER 4: DATA, VARIABLE CONSTRUCTION AND ESTIMATION METHODOLOGY

4.1 Introduction

The purpose of this chapter is to discuss the sources of data, the construction of variables, and the estimation methodology. The sources of data used in this study are described in section 4.2. Section 4.3 sets out the details on how to construct the variables used in the regression analyses. Finally, the proposed time series econometric techniques for the empirical tests are described in section 4.4.

4.2 Sources of Data

Annual data for the period 1960–2003 are used in the estimation. The national economic database of Malaysia is considered relatively good by developing country standards. The data have been collected from various sources. Most of the data series are directly obtained or compiled from domestic sources, including Economic Reports of the Ministry of Finance Malaysia, Yearbook of Statistics of the Department of Statistics Malaysia, Annual Reports of BNM, Money and Banking in Malaysia (1989, 1994) of BNM, Quarterly Bulletin of BNM and Monthly Statistical Bulletin of BNM. Some data series are also obtained from the international sources, such as World Development Indicators (2005) of The World Bank and International Financial Statistics (2005) of the International Monetary Fund, where the compiled data are originally collected from domestic sources. In the data compilation, the most recent publication of the above-mentioned sources has been referenced to ensure that the most up-to-date data are used in the empirical analyses.

Some of the data used in this study are not directly available. For instance, private saving, macroeconomic uncertainty, user cost of capital, etc., cannot be directly obtained from the above-mentioned sources. In these cases, the data are derived by proxies using the standard conversion procedures. The following section defines the variables used in each of the empirical specifications, and explains how each has been derived. Data sources, the original data series and the constructed variables are provided in Appendices 2 to 6.

4.3 Construction of Variables

(a) Financial deepening

Choosing variables to indicate the level of financial deepening in an economy and measuring efficiency of the financial systems are perplexing problems in an empirical study of this nature due to a diverse array of agents and institutions involved in the financial intermediation activities. The extent of financial deepening is best measured by the intermediaries' ability to reduce information and transaction costs, mobilize savings, manage risks and facilitate transactions. However, there are no directly measurable and reliable data available. Consequently, an indirect approach to measuring financial deepening using an appropriate indicator has been the standard practice adopted in this field of study. This study considers two commonly used measures of financial deepening, defined as:

$$MON_t = \frac{M2_t}{GDP_t} \tag{1}$$

$$PC_t = \frac{Bank\ credit\ to\ the\ private\ sector_t}{GDP_t} \tag{2}$$

Although it has been widely used in the literature of financial development, the monetization ratio (MON_t) in Eq. (1) is not a particularly good indicator of financial deepening since it reflects the extent of transaction services provided by financial systems, rather than the ability of financial systems to channel funds from depositors to investment projects. The alternative measure of financial deepening in Eq. (2), bank credit to the private sector as a ratio of GDP (PC_t), is often argued to be a more superior measure (Levine, Loayza and Beck, 2000). Since the private sector is able to utilize funds in a more efficient and productive manner compared to the public sector, the exclusion of credit to the public sector better reflects the extent of efficient resource allocation.

(b) Real interest rate

Real interest rate (RI_t) is defined as the 12-month commercial banks deposit interest rate minus the expected inflation rate (π_t^*). Since π_t^* is not directly observable, the adaptive expectations model is proposed to explain how expectations are formed. This model, popularized by Cagan (1956), postulates that economic agents adapt their expectations based on past experience by learning from their mistakes. The model $\pi_t^* - \pi_{t-1}^* = \lambda(\pi_t - \pi_{t-1}^*)$ states that expectations are revised each period by a proportion

λ of the difference between the inflation rate observed today (π_t) and its anticipated value in the previous period (π^*_{t-1}). We follow the standard practice by assuming $\lambda = 1$, implying that expectations are realized instantly in the same period. Hence, the expected inflation rate equals the current inflation rate. The rate of inflation is constructed using the consumer price index (CPI). Therefore, the real interest rate is given as:

$$RI_t = Deposit\ interest\ rate_t(DIR_t) - inflation\ rate_t(\pi_t) \qquad (3)$$

(c) Financial liberalization index

To measure the level of financial liberalization (FL_t), it is necessary to take interest rate policies, statutory reserve and liquidity requirements, and directed credit programs into consideration. However, using all these variables in the equation of financial development may pose some econometric problems since the underlying policy variables may be highly correlated. On the other hand, using them individually may also lead to omitted variables bias since the central bank may impose some of these controls concurrently. Thus, this study proposes to construct an index for financial liberalization following the approach adopted by Bandiera, Caprio, Honohan and Schiantarelli (2000) and Demetriades and Luintel (1997, 2001). Nine series are collected for repressionist policies. Six are interest rate controls, including a maximum lending rate for priority sectors, a policy intervention rate, a minimum lending rate, a maximum lending rate, a minimum deposit rate, and a maximum deposit rate. These policy controls are translated into dummy variables, which take the value of 1 if a control is present and 0 otherwise. The remaining three policies are directed credit programs, statutory reserve ratio, and liquidity ratio, measured in percentages.[34] The data for financial policies are collected from BNM, and provided in Appendices 3a and 3b.

Using these nine variables, a summary measure of financial liberalization, which represents the joint impact of the financial repressionist policies, is developed by employing the method of principal component analysis.[35] The inverse of this measure can be interpreted as the extent of financial liberalization. Theoretically, this new index for financial liberalization is able to capture most of the information from the original

[34] Apart from the *bumiputra* community, directed credit programs also include minimum lending to other priority sectors, including agriculture, manufacturing, small and medium size enterprises, and individuals for housing loans. Only the *bumiputra* sector, which is the largest beneficiary sector, is considered in the analysis since its data is available on a systematic basis and can be quantified.

[35] Principal component analysis has often been used to reduce a large set of correlated variables into a smaller set of uncorrelated variables, known as principal components (see Stock and Watson, 2002a, b).

dataset that consists of nine policy variables. Given its conciseness, this approach sufficiently deals with the problems of multicollinearity and over-parameterization.

Table 4.1: Principal component analysis for the financial liberalization index

	Principal component								
	1	2	3	4	5	6	7	8	9
Eigenvalues	4.450	1.876	0.832	0.654	0.549	0.275	0.215	0.108	0.042
% of variance	0.494	0.208	0.092	0.073	0.061	0.031	0.024	0.012	0.005
Cumulative %	0.494	0.703	0.795	0.868	0.929	0.959	0.983	0.995	1.000
Variable	Eigenvector								
	1	2	3	4	5	6	7	8	9
PSR	-0.393	0.069	0.379	-0.297	0.325	0.428	0.034	0.277	-0.492
PIR	-0.335	-0.340	-0.435	0.140	-0.236	-0.215	0.514	0.255	-0.364
MIL	0.360	-0.171	0.488	0.275	-0.432	-0.038	-0.035	-0.210	-0.542
MAL	-0.295	-0.431	0.432	0.046	-0.368	0.238	0.106	0.180	0.551
MID	0.263	-0.348	-0.033	-0.825	-0.069	-0.047	0.214	-0.276	-0.013
MAD	0.380	-0.313	-0.269	-0.074	-0.090	0.200	-0.489	0.621	-0.080
PSL	-0.408	0.026	0.166	-0.253	-0.179	-0.669	-0.499	0.093	-0.072
SRR	-0.106	0.561	-0.211	-0.229	-0.686	0.323	-0.019	0.007	-0.030
CLR	0.354	0.362	0.313	-0.109	0.007	-0.345	0.435	0.558	0.123

Notes: PSR = maximum lending rate for priority sector, PIR = policy intervention rate, MIL = minimum lending rate, MAL = maximum lending rate, MID = minimum deposit rate, MAD = maximum deposit rate, PSL = priority sector (native Malays community) lending target rate, SRR = statutory reserve ratio, and CLR = commercial bank liquidity ratio.

Table 4.1 presents the results obtained from principal component analysis. The eigenvalues indicate that the first principal component explains about 49.4 per cent of the standardized variance, the second principal component explains another 20.8 per cent and so on. The first principal component is computed as a linear combination of the nine financial policy measures with weights given by the first eigenvector. In this case, the six largest principal components are extracted, and they are able to capture 95.9% of the information from the original data set. The remaining principal components are not considered since their marginal information content is relatively small. The percentages of variance are adjusted to make sure that their absolute values sum up to one. These adjusted values are then used as the weights to compute the index. In this connection, the first principal component, which accounts for 49.4 per cent of the total variation of the policy variables, has a weight of 49.4/95.9, and so on. The reciprocal of this index represents the extent of financial liberalization.

(d) Saving series

Malaysia does not have directly estimated saving data. Gross national saving (GNS_t) is defined as the sum of gross capital formation and balance on current account (including goods, services and transfers) (BNM, 1994). Public saving (PUS_t) refers to total public sector current surpluses or deficits. That is, it is defined as government revenue minus operating expenditure plus non-financial public enterprise surpluses. Private saving (PRS_t) is derived by taking GNS_t minus PUS_t. These saving variables are measured in real terms using the GDP deflator. Ideally, a consumption deflator should be used to obtain real saving. However, sufficiently long time series data on a consumption deflator is not available for Malaysia.

(e) Private income

Real private income is measured by gross private income (GPI_t), deflated by the GDP deflator. GPI_t is the difference between gross national product (GNP_t) and government revenue (GR_t). The former equals GDP plus net factor income payments from abroad (NFI_t), while the latter refers to the sum of public saving (PUS_t) and public consumption (PUC_t).

$$\begin{aligned} GPI_t &= GNP_t - GR_t \\ &= (GDP_t + NFI_t) - (PUS_t + PUC_t) \end{aligned} \tag{4}$$

(f) Young and old age dependency

Young age dependency (YAG_t) is population with ages 0-14 to working-age population with ages 15-64, whereas old age dependency (OAG_t) is defined as population with ages 65 and above over the working population age. Although the common retirement age in Malaysia is 55, data constraints limit following this definition, which has been widely adopted in many past studies on this subject.[36]

$$YAG_t = \frac{Population\ ages\ 0-14}{Population\ ages\ 15-65} \tag{5}$$

$$OAG_t = \frac{Population\ ages\ >65}{Population\ ages\ 15-65} \tag{6}$$

[36] For example, see Edwards (1996), Horioka (1997), Masson, Bayoumi and Samiei (1998), Loayza, Schmidt-Hebbel and Serven (2000) and Athukorala and Tsai (2003), among others.

(g) Expected benefits of pension saving

The cumulative contributions of employee provident funds relative to private income are used to measure the expected benefit of pension saving (PEN_t). Hence, it is a stock variable of provident funds with adjustment for withdrawals. This ratio is lagged by one period since individuals are likely to base saving decisions on the amount of accumulated EPF saving available at the beginning of the year.

$$PEN_t = \frac{Cumulative\ EPF\ saving_{t-1}}{GPI_{t-1}} \tag{7}$$

(h) Investment

Private investment (PRI_t) is measured by gross fixed private capital formation ($GPRI_t$), public investment (PUB_t) is measured by gross fixed public capital formation ($GPUB_t$), and private domestic investment (PDI_t) is measured by private investment minus FDI_t. However, it must be highlighted that the estimation for domestic investment may be subject to some measurement issues, since the data sources for private investment are not compatible with those obtained for FDI_t. In Malaysia, like many other countries, data on private investment are obtained directly from the national account statistics. Data on FDI_t are taken from the balance of payments accounts, which are estimated by BNM using capital flow data from commercial bank records, and supplemented by information directly obtained from a company survey on reinvested earnings of foreign-invested firms (multinational enterprise subsidiaries). Although the incompatibility of data sources may be a concern, it is unlikely to distort the estimation results significantly. All investment series are expressed in real terms using the gross capital formation deflator.

(i) User cost of capital

It is well-known that user cost of capital (COC_t) is difficult to estimate, especially for developing countries. A commonly used proxy for the user cost of capital is the real domestic interest rate. However, this measure ignores other important factors, i.e., tax rate, investment credit, capital stock depreciation and the price of capital stock, which may have a significant impact on investment decision making. An analytical expression for the user cost of capital has been developed by Hall and Jorgenson (1969). It refers to the cost of using one unit of capital relative to the cost of purchasing that unit of capital during a particular period, which can be formulated as:

$$COC_t = PK_t\left(\frac{(i_t - \pi_t + \delta_t)(1-k_t)(1-\tau_t z_t)}{1-\tau_t}\right) \quad (8)$$

where PK_t is the price of a unit of capital input, i_t is the financing cost of capital good, π_t is the inflation rate, δ_t is the rate of depreciation, k_t is the rate of investment tax credit, z_t is the present value of tax depreciation allowances, and τ_t is the rate of corporate income taxes. For the case of Malaysia, it is difficult to estimate the rate of investment tax credit (k_t) and the present value of tax depreciation allowances (z_t). Hence, both k_t and z_t are assumed to be zero. Therefore, Eq. (8) reduces to:

$$COC_t = PK_t\left(\frac{i_t - \pi_t + \delta_t}{1-\tau_t}\right) \quad (9)$$

The price of capital (PK_t) is measured by the deflator of gross capital formation. Commercial banks' average lending rates (CAL_t) are used to measure the financing cost (i_t). Ideally, the weighted average costs of financing should be used, since firms in Malaysia were not restricted from borrowing overseas prior to 1995. However, data constraints limit consideration to only the domestic cost of financing in the computation of the user cost of capital. The rate of inflation (π_t) is constructed from the GDP deflator.[37] The depreciation rate (δ_t) is assumed to be constant at 5 per cent. This implies that capital stocks in Malaysia have an average life of 20 years. The assumption that capital stocks depreciate at the rate of 5 per cent per annum is consistent with Sarel (1997) and Gan and Soon (2000) in their analyses of productivity growth for ASEAN countries and Malaysia, respectively.

The corporate tax rate (τ_t) is measured by the statutory company tax rate (CTR_t). In reality, tax structures across different industries are complex due to different treatments of tax credits and tax exemptions during different periods, and the statutory tax rate is just an approximation, which has its shortcomings. For instance, the provision of generous depreciation allowances may result in a lower effective tax rate although the statutory tax rates appear high. Hence, caveats must be borne in mind that the assumptions of zero investment tax credit and no tax depreciation allowances may over-estimate the effective tax rate and therefore the user cost of capital.

[37] $\pi_t = \frac{GDP\ deflator_t - GDP\ deflator_{t-1}}{GDP\ deflator_{t-1}} \text{x}100\%$.

(j) Bank credit

As highlighted previously, bank credit to the private sector is often used in the finance and development literature to measure how efficiently funds are utilized in financial systems, given that the private sector is able to utilize funds in a more efficient and productive manner compared to the public sector. The availability of bank credit (BC_t) is measured by changes in commercial bank lending to the private sector in real terms (see, e.g., Tun Wai and Wong, 1982; van Wijnbergen, 1982; Blejer and Khan, 1984),[38] and this is a flow variable rather than a stock variable. An increase in the value of this variable indicates greater relaxation of financial constraints.

$$BC_t = \Delta \ln \left(\frac{Bank\ credit\ to\ the\ private\ sector_t}{GDP\ deflator_t} \right) \tag{10}$$

In this research, macroeconomic uncertainty (UNC_t) refers to a situation when there are severe fluctuations in output levels, which induce greater variance in returns on investment activities. To obtain a proxy for macroeconomic uncertainty (UNC_t), the approach of Athukorala and Sen (2002) is followed by taking the three-year moving average deviation of the change in output between period t and t-1, defined as:

$$UNC_t = \left[(1/3) \sum_{i=1}^{3} (\ln GDP_{t+i-1} - \ln GDP_{t+i-2})^2 \right]^{1/2} \tag{11}$$

(k) Capital stocks

Department of Statistics (1965, p.16) estimated capital stocks in 1954 were in the range of RM 6,000-7,000 million. Since no estimate is available for 1960, the upper limit of RM 7,000 million is taken to be the initial level of capital stocks for Malaysia in 1960. It is assumed that capital stocks in Malaysia have an average life of 20 years and therefore depreciate at the rate 5% per annum. This is consistent with the assumption used in the computation of the user cost of capital (COC_t). Capital stocks (K_t) can be computed using the standard perpetual inventory model as:

$$K_t = (1-\delta)K_{t-1} + GCF_t \tag{12}$$

where the depreciation rate (δ) is assumed to be 5%, and GCF_t refers to gross capital formation.

[38] Other commonly used measures include credit to the private sector in real terms and the ratio of private credit to GDP. The use of these measures is inappropriate in this case as they are highly correlated with other variables considered in the private investment model, notably output and public investment, with correlation coefficients higher than 0.95.

The computation of real private capital stocks (PRK_t) and real public capital stocks (PUK_t) deserves some explanation. First of all, the initial level of physical stocks of RM 7,000 million in 1960 needs to be split. The share of private and public fixed capital formation in total fixed capital formation over the period 1960-2003 is used as the basis of segregation in this study. The computation shows that private fixed capital formation contributes an average of 60 per cent to the total fixed gross capital formation. Thus, PRK_t and PUK_t in 1960 are obtained to be RM 4,200 million and RM 2,800 million, respectively. These two series are deflated by the gross capital formation deflator to express them in real terms.

(l) Labour force

Following the definition of World Development Indicators (2005), total labour force (LF_t) refers to all individuals willing to supply labour for the production of goods and services during a specified period. It comprises both the employed and the unemployed. Labour force includes the armed forces, unemployed individuals, and first-time job-seekers, but excludes housewives and other unpaid workers in the informal sector.

4.4 Econometric Methodology

4.4.1 General issues in modelling time series data

The main objective of this empirical study is to estimate the long-run relationships involving financial development, private saving, private investment and aggregate output. The estimation of a long-run relationship often begins with unit root tests. If the mean, variance or autocovariance at various lags of a process change over time, the series is said to be non-stationary. Such series either contains a deterministic trend or a unit root. In contrast, if a time series is stationary, its mean, variance and autocovariance at various lags are constant over time. A non-stationary series is said to be integrated of order d, or $I(d)$, if it needs to be differenced d times to achieve stationarity.

Most "classical" econometric theory is built on the assumption of stationarity (Hendry and Juselius, 2000). Regressing a non-stationary variable on another non-stationary variable may result in a "spurious" regression, in which the estimates and test statistics are misleading. However, if a particular linear combination of a set of non-stationary variables can be found such that the linear relationship is stationary, a long-run relationship between these variables is said to exist, and the variables are

cointegrated (Engle and Granger, 1987). Evidence of cointegration between variables can be viewed as evidence against the possibility of the estimated relationship being "spurious" or nonsense (see Granger and Newbold, 1974).

Recent developments in non-stationarity and cointegration theory have contributed to a better understanding of the short-run and long-run dynamics in economics, and the equilibrium behaviour of economic variables. Cointegration testing provides evidence on the existence of a stable long-run linear relationship between the variables under consideration. The existence of such a long-run equilibrium relationship has an important implication for the short-run behaviour of the underlying variables, given that there must be a mechanism that drives the variables to their long-run relationship. This adjustment process is modelled by an error-correction mechanism, which leads to the formulation of an error-correction model (ECM).

To sum up, the three important aspects to consider while estimating relationships between variables are unit root (integration) properties, the multivariate aspect and the dynamics. An ideal econometric estimation technique should be able to: 1) incorporate all prior knowledge about the presence of unit roots; 2) account for the simultaneous determination of several variables (so as to avoid endogeneity bias); and 3) adequately capture both short and long run dynamics.

4.4.2 Traditional cointegration tests and their limitations

The two most widely adopted cointegrated techniques are the two step residual-based procedure of Engle and Granger (1987) and the system-based reduced rank approach of Johansen (1991, 1995). The former assumes that there is only one unique cointegrating vector whereas the latter allows for the estimation of multiple cointegrating vectors when the test involves more than two variables.[39]

Although the residual-based approach can be implemented easily, it is subject to some shortcomings. Firstly, the estimation of the long-run equilibrium relationship involves a simple OLS regression on levels of the variables. This method is appealing due to computational convenience. However, as pointed out by Banerjee, Dolado, Hendry and Smith (1986), the omission of dynamics can generate substantial bias in finite samples, and this severely undermines the performance of the estimator. Also,

[39] For a survey of other cointegration techniques such as the nonlinear least squares estimator of Stock (1987), the canonical correlations of Bossaerts (1988), the full information maximum likelihood (FIML) estimator for cointegrated system of Phillips (1988, 1991) and Phillips and Hansen (1990), the common trend approach of Stock and Watson (1988), and the three-stage FIML procedure of Engle and Yoo (1991), see Muscatelli and Hurn (1992, 1995) and Gonzalo (1994).

endogeneity bias can affect small sample estimates, even though endogeneity has negligible effects asymptotically. Secondly, the two-step procedure uses the generated residual in the first step to form a new regression model in the second stage. Hence, the errors introduced in the first step are carried into the second step (Enders, 2004). Thirdly, Park and Phillips (1988) have pointed out the OLS estimator in the first step has a non-normal asymptotic distribution that depends on nuisance parameters. Hence, the reported *t*-statistics on the long-run parameters are misleading.

Similarly, the Johansen approach is not free from criticism. While the inclusion of lags ameliorates the omitted lagged variable bias that affects the two-step approach, and the system approach removes endogeneity bias, insufficient degrees of freedom to choose the optimal number of lags appears to be the most serious drawback of Johansen's method (see Gonzalo, 1994). The small sample properties of these approaches are also unknown. Another remark concerns the number of cointegrating vectors found. When more than one cointegrating vectors is found, it is often hard to interpret each implied economic relationship.

Both the residual-based and the system-based approach are criticized on the grounds that the number of lags is unknown and the residuals are assumed to be Gaussian. Furthermore, the test results may be sensitive to the inclusion of intercepts and trends in the specification. In addition, both approaches focus on cases in which the underlying variables are integrated of order one, i.e., $I(1)$. In the presence of a mixture of $I(0)$ and $I(1)$ variables, the implementation of these techniques become more onerous. Furthermore, the presence of $I(2)$ variables can introduce further complications.[40]

4.4.3 Alternative cointegration test and its advantages

These issues prompt consideration of an alternative cointegration technique. The autoregressive distributed lag (ARDL) bounds test of Pesaran, Shin and Smith (2001) proposed in this study is able to address all the above concerns. This procedure has several desirable features.

Firstly, it is common for macroeconomic variables to be affected by their own past values and hence their relationship should be viewed in the context of a multivariate autoregressive process. The bounds tests are performed based on an ARDL framework, which contains a rich set of dynamics and therefore addresses the concern about omitted lagged variable bias.

[40] A variables is said to follow an $I(2)$ process when it needs to be differenced twice to attain stationarity. Evidence of an $I(2)$ variable can be established when the null hypothesis that the first-difference of a variable has a unit root is not rejected.

Secondly, the approach has several desirable statistical properties, such as precise estimates of long-run parameters and valid *t*-statistics, even in the presence of endogenous explanatory variables. Using Monte Carlo experiments, Inder (1993) demonstrates that the problems of endogeneity bias are minimal and relatively unimportant in many situations.[41] Similarly, Pesaran and Shin (1998) show that appropriate modification of the orders of the ARDL model, together with an IV estimation approach, is adequate to correct for both the omitted lagged variables bias and the problems of endogeneity bias. They also show that the OLS estimators of the short-run parameters are consistent and the ARDL based estimators of the long-run coefficients are super-consistent in small sample sizes. Hence, valid inferences on the long-run parameters can be made using standard normal asymptotic theory, once standard errors have been appropriately adjusted.

Thirdly, the method allows for the specification of a combination of stationary, i.e., $I(0)$, and non-stationary variables, i.e., $I(1)$, in the model. The problems of having a mixture of $I(0)$ and $I(1)$ variables in cointegration analysis have been highlighted in a survey article by Pagan and Wickens (1989). Pesaran, Shin and Smith (2001) show that the ARDL approach yields consistent and asymptotically normal estimates for the long-run coefficients regardless of whether the underlying variables are $I(0)$ or $I(1)$.

Fourthly, under an ARDL framework, the proposed bounds procedure provides a convenient step to adopt the general-to-specific modelling technique of Hendry (1995) in order to obtain a parsimonious representation of the data generation process.

The relative attractiveness of this approach has been assessed in several recent studies. In Pesaran and Shin (1998), the small sample performance of the ARDL procedure and the fully modified OLS approach of Phillips and Hansen (1990) are compared using Monte Carlo experiments. The results provide strong evidence in favour of the ARDL approach. In another study that evaluates the forecasting performance of three single equation time series estimation techniques, i.e., Engle-Granger's ECM, the fully modified OLS and the ARDL approach, Fatai, Oxley and Scrimgeour (2003) find that the ARDL approach yields the best forecasting performance. One shortcoming of the approach is that it only allows for only single

[41] Inder (1993) shows that while endogeneity bias can be expected in an ARDL framework, it does not have a great influence on the estimated cointegrating relationships. He also demonstrates that the effects of endogeneity bias are far less severe compared to those of omitted lagged variables bias. Hence, Inder (1993) proposes the use an unrestricted ECM to deal with the problems of omitted lagged variables bias, and suggests using instruments to adjust for endogeneity bias, if this is a concern.

long-run relationship between the variables, but in many applications, multiple long-run relationships are not expected.

4.4.4 The testing procedure

The testing procedure involves four steps. The first is to examine the integration properties of each variable. In order to apply the ARDL bounds procedure, it is important to ensure the variables under consideration are not integrated at an order higher than one. In the presence of $I(2)$ variables, the critical values provided by Pesaran, Shin and Smith (2001) are no longer valid. The second step is to test for cointegration using the ARDL bounds test, which consists of both a t-test and an F-test. If cointegration is detected, the third step is to obtain a long-run model using an unrestricted ECM as proposed by Inder (1993). An instrumental technique is employed to correct the standard errors so that valid inference can be drawn (Bewley, 1979). Finally, to obtain a parsimonious ECM, the general-to-specific modelling technique of Hendry (1995) is used.

4.4.5 Unit root tests

Three unit root tests – augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test and the Kwiatkowiski-Phillips-Schmidt-Shin (KPSS) test – are used to assess the degree of integration of the variables under investigation. The first two tests account for the structure of the data in different ways whereas the choice of the KPSS test is motivated by the argument that tests designed on the basis of the null that a series is $I(1)$ have low power for rejecting the null. Since most economic time series are not very informative about whether or not there is a unit root, it would be useful to perform tests of the null hypothesis of stationarity as well as tests of the null hypothesis of a unit root (Kwiatkowski, Phillips, Schmidt and Shin, 1992). These unit root tests are briefly described in the following.

(a) Augmented Dickey-Fuller (ADF) test

One commonly used method to test for the existence of unit roots is the augmented Dickey-Fuller test (see Dickey and Fuller, 1979). This involves running the following univariate regression:

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta y_{t-i} + u_t \qquad (13)$$

The above specification can be appended with a deterministic trend term if appropriate. The null hypothesis is that $\beta = 0$ (there is a unit root) against the alternative hypothesis $\beta \neq 0$ (stationary). The test statistic is given as:

$$DF = \hat{\beta} / \hat{\sigma}_{\hat{\beta}} \tag{14}$$

where $\hat{\sigma}_{\hat{\beta}}$ is the least squares standard error of $\hat{\beta}$. However, given that the distribution of ADF does not follow the standard student's *t*-distribution, the computed *t*-statistic is compared against the critical values provided by MacKinnon (1996). Highly negative test statistics reject the null hypothesis.

(b) Phillips-Perron (PP) test

The ADF test assumes the errors are statistically independent and have a constant variance. Hence, in applying this technique it must be ensured that the error terms are uncorrelated and have constant variance. The alternative approach suggested by Phillips and Perron (1988) requires little attention to be paid to the assumptions of the error terms. The PP test can be viewed as a generalization of the ADF test, which accounts for the heteroskedasticity and serially correlated error terms. A non-parametric correction to the *t*-test statistic is undertaken to account for the serial correlation that might be present, so that serial correlation does not affect the asymptotic distribution of the test statistic.

An asymptotically valid unit root test for Eq. (14) is given by the Phillips *Z*-test:

$$Z(\tau_\mu) = (S_u / S_{Tl})\tau_\mu - \frac{1}{2}(S_{Tl}^2 - S_u^2)\left\{ S_{Tl}\left[T^2 \sum_{t=2}^{T} (y_{t-1} - \bar{y})^2 \right]^{1/2} \right\}^{-1} \tag{15}$$

where τ_μ is the *t*-statistic associated with testing the null hypothesis $\beta = 0$ in Eq. (14), $S_u^2 = T^{-1}\sum_1^T (u_t^2)$ and $S_{Tl}^2 = T^{-1}\sum_1^T (u_t^2) + 2T^{-1}\sum_1^l \sum_{t=j+1}^T u_t u_{t-j}$, which are consistent estimators of σ_u^2 and σ^2, respectively, and T is the number of observations. The critical values are the same as those for the ADF test.

(c) Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test

The Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test is different from the above unit root tests in that the series is assumed to be stationary under the null. The KPSS test assumes a time series can be decomposed into three components: a

deterministic time trend term (δt), a random walk process (r_t), and a stationary error term (ε_t), as given in Eq. (16).

$$y_t = \delta t + r_t + \varepsilon_t \tag{16}$$

where r_t is a random walk process given as $r_t = r_{t-1} + u_t$, and u_t is assumed to follow $i.i.d.(0, \sigma_u^2)$. Given that ε_t is stationary, the stationary hypothesis implies $\sigma_u^2 = 0$. Under this hypothesis, y_t is trend stationary. The KPSS test statistic tests the null hypothesis of stationary against the alternative of non-stationary, and can be computed as:

$$LM = T^{-2} \sum_{t=1}^{T} S_t^2 / \sigma^2(p) \tag{17}$$

where S_t^2 is the partial sum process of the residuals from a regression of y_t on an intercept and time, $\sigma^2(p)$ is a consistent estimate of the error variance from the same regression, p is the lag truncation parameter, and T is the number of observations. The distribution for the LM test statistic is non-standard. The critical values are provided by Kwiatkowski, Phillips, Schmidt and Shin (1992) based on Monte Carlo simulation.

4.4.6 The data generation process

An important concept here is the data generation process (DGP), which refers to the probability mechanism in the space of those variables under analysis. In other words, it is the joint distribution of the subset of variables under analysis or the process of generating the sample of data.

To describe the ARDL bounds procedure, it is assumed the data generating process for the relationship of interest is a log-linear vector autoregressive (VAR) model in levels, which can be augmented with deterministics, such as intercepts and time trends. The idea here is to specify a set of useful information to provide an adequate approximation for the DGP. Such a general model captures the key features of the underlying dataset, and its formulation is often guided by economic theory. The VAR model is given as:

$$\boldsymbol{x}_t = \boldsymbol{\mu} + \sum_{i=1}^{p} \boldsymbol{\phi}_i \boldsymbol{x}_{t-i} + \boldsymbol{\varepsilon}_t \tag{18}$$

where $\boldsymbol{x}_t$ is a vector of k endogenous variables, $\boldsymbol{\mu}$ is a vector of deterministic terms, and $\boldsymbol{\phi}_j$ is a matrix of VAR parameters for lag i. The vector of error terms is $\boldsymbol{\varepsilon}_t \sim \text{IN}(\mathbf{0}, \boldsymbol{\Omega})$, where $\boldsymbol{\Omega}$ is the residual covariance matrix. It is well established by

Engle and Granger (1987) that cointegrated variables must have an error correction representation in which an error correction term (ECT) is incorporated into the model. Accordingly, a vector error correction model (VECM) is formulated to reintroduce the information lost in the differencing process, thereby allowing for long-run equilibrium as well as short-run dynamics. The VAR model in Eq. (18) can be transformed into a vector error correction model (VECM) after some mathematical manipulations. This leads to:

$$\Delta \boldsymbol{x}_t = \boldsymbol{\mu} + \pi \boldsymbol{x}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\gamma}_i \Delta \boldsymbol{x}_{t-i} + \boldsymbol{\varepsilon}_t \tag{19}$$

By construction, π has rank r (with $r < k$) and can be decomposed into $\pi = \alpha\beta'$. The elements of α are known as the speed of adjustment parameters, it is a (k x r) matrix where a larger α suggests a faster convergence towards the long-run equilibrium when there are short-run deviations from its equilibrium. β' is a (k x r)' matrix of cointegrating vectors, that is the long-run coefficients in the VECM.

Hendry, Pagan and Sargan (1984) propose that expectations formation by economic agents and non-instantaneous adjustment leads to the theoretical consideration of dynamics. Empirically, dynamics can be adequately represented by ARDL models. By breaking Eq. (19) into k individual equations, k unrestricted ARDL models are obtained, and they can be estimated using OLS. Stock (1987) proves that OLS regression yields super-consistent estimators of the cointegrating parameters such that the OLS estimates converge faster to their true parameter values than in other OLS model with stationary variables.

For illustration purpose, consider the special case of $r = 1$, the conditional ECM of the first variable, X_{1t}, can be expressed as:

$$\begin{aligned} \Delta X_{1t} = {} & \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{2t-1} + \cdots + \beta_k X_{kt-1} + \\ & \sum_{i=1}^{p} \gamma_{1i} \Delta X_{1t-i} + \sum_{i=0}^{p} \gamma_{2i} \Delta X_{2t-i} + \cdots + \sum_{i=0}^{p} \gamma_{ki} \Delta X_{kt-i} + \varepsilon_t \end{aligned} \tag{20}$$

The above econometric specification is based upon the assumption that the disturbance term ε_t is serially uncorrelated. Hence, in empirical implementation, it is critical to ensure that an optimal lag order p of the underlying model is chosen appropriately in order to strike a satisfactory balance between the two competing concerns, in which the lag order is high enough to ameliorate the residual serial correlation problems and low enough that the conditional ECM is not subject to over-parameterization problems. This is particularly important in this study given that a small

sample is used. Augmenting the specification with an adequate number of lagged changes in the regressors also mitigates the problems of bias due to omitted lags.

4.4.7 The ARDL bounds tests

The ARDL bounds tests are performed based on the conditional ECM in Eq. (20). The procedure involves using two separate statistics for testing for the existence of a long-run relationship: an *F*-test for the joint significance on the coefficients of the lagged level terms ($H_0 : \beta_1 = \beta_2 = ... = \beta_k = 0$), and a *t*-test for the significance of the coefficient associated with X_{1t} ($H_0 : \beta_1 = 0$). Two asymptotic critical value bounds provide a test for cointegration when the independent variables are $I(d)$ (where $0 \leq d \leq 1$). The lower bound assumes all the independent variables are $I(0)$, and the upper bound assumes they are $I(1)$. If the test statistics exceed their respective upper critical values, the null is rejected and it can be concluded that a long-run relationship exists. If the test statistics fall below the lower critical values, the null hypothesis of no cointegration cannot be rejected. If the statistics fall within the band, the statistical inference is inconclusive.

The critical values are provided by Pesaran, Shin and Smith (2001). An excerpt of these critical values is given in Appendix 8. Following the results of the ARDL bounds tests, the long-run relationship can first be estimated and then Hendry's (1995) general-to-specific modelling technique can be employed to obtain a parsimonious specification.

4.4.8 The long-run model

Traditionally, long-run equilibrium relationships have been obtained by using the Engle and Granger (1987) two-step procedure, which involves a simple OLS regression on the levels of the variables. This method is appealing due to the benefit of computational convenience. However, as pointed out by Banerjee, Dolado, Hendry and Smith (1986), the omission of dynamics in this levels regression can generate substantial bias in finite samples, severely undermining the performance of the estimator. In view of this, the unrestricted ECM estimator proposed by Inder (1993) is adopted. This involves estimating the long-run parameters by incorporating adequate

dynamics into the specification, as given in Eq. (23).[42] Once this is done, estimation of the long-run parameters can be carried out using the standard OLS method.

$$X_{1t} = \delta_0 + \delta_1 X_{2t} + \delta_2 X_{3t} + \cdots + \delta_k X_{kt} + \sum_{i=0}^{p} \gamma_{1i} \Delta X_{1t-i} + \sum_{i=0}^{p} \gamma_{2i} \Delta X_{2t-i} + \cdots + \sum_{i=0}^{p} \gamma_{ki} \Delta X_{kt-i} + u_t \quad (21)$$

When the above long-run relationship is estimated, it will generally give less biased estimates compared to that obtained from a "potentially cointegrating regression".[43] However, as pointed out by Phillips (1988), this approach is not asymptotically optimal, given that it takes no account of the possible endogeneity of the explanatory variables. Hence, proper inference cannot be made without adjusting for this problem. Two approaches are available to obtain valid estimates and standard errors: the delta method and the instrumental variable (IV) approach of Bewley (1979). The choice between these two approaches is only a matter of computational convenience, given that they yield identical results (Pesaran and Shin, 1998). Thus, for simplicity, to obtain valid standard errors the latter approach is followed. Bewley (1979) suggests using the first lag of X_{1t}, X_{2t}, ..., and X_{kt} as instruments for the current differenced X_{1t}, X_{2t}, ..., and X_{kt}. The Monte Carlo evidence of Inder (1993) shows that this technique yields precise estimates and valid *t*-statistics, even in the presence of endogenous explanatory variables. Therefore, valid inference can be drawn from the estimated results.

The long-run model for X_{1t} can be obtained from the reduced form solution of Eq. (21), when all differenced terms of the regressors are set to zero, i.e., $\gamma_{1i} = \gamma_{2i} = \cdots = \gamma_{ki} = 0$ for i = 0, 1, ..., p. Thus, the following steady-state solution is obtained:

$$X_{1t} = \delta_0 + \delta_1 X_{2t} + \delta_2 X_{3t} + \cdots + \delta_k X_{kt} \quad (22)$$

4.4.9 Short-run dynamic model

Having obtained this long-run relationship, the error-correction term (ECT) can be obtained by taking $X_{1t-1} - \delta_0 - \delta_1 X_{2t} - \delta_2 X_{3t} - \cdots - \delta_k X_{kt}$ to formulate an ECM. In

[42] Pesaran and Shin (1998) have also highlighted that the error term may be correlated with current differenced terms. Thus, the specification needs to be augmented with a sufficient number of lagged differenced terms in order to make valid inference.

[43] This involves running a simple OLS on the levels of the variables, which is the first step of the Engle and Granger (1987) two-step procedure.

the hypothesis testing of the presence of a long-run level equation for ΔX_{1t}, it is important to ensure no restrictions are imposed on the coefficients of the lagged terms. Otherwise, the test results are subject to a pre-testing problem (Pesaran, Shin and Smith, 2001). However, to estimate both the level effects and short-run dynamics of the adjustment in X_{1t}, the use of a parsimonious specification is more desirable. To this end, Hendry's (1995) general-to-specific modelling approach is adopted to derive a satisfactory model for equation ΔX_{1t}, as discussed below.

4.4.10 General-to-specific modelling technique

In Hendry's approach, econometric models are formulated based on statistical data and economic theory. Statistical data are realizations from the DGP whereas economic theory guides the econometric specification. As Hendry (1983) argues, every empirical model is a reduction of the underlying DGP, and it is nested in the DGP. In sum, Hendry's approach is a simplification of the unknown DGP.

Pagan (1987) summarizes Hendry's methodology as the following four steps. The first step formulates an initial general model, based on economic theory, to suggest which variables might enter the equilibrium specification. Such a general unrestricted model provides an approximation of the DGP. At this stage, the lag length for each variable is chosen to be as large as econometrically feasible. The next step involves reparameterizing the model into an error-correction representation so that it is easier to understand and interpret in terms of the final equilibrium. Next, the complexity of the general model can be reduced by deleting statistically insignificant variables, or equally, imposing acceptable restrictions, to obtain a "congruent" model. That is, the final parsimonious model should be able to adequately characterize the empirical evidence within the proposed theoretical framework. The resulting model is subject to a series of diagnostic checks through an extensive analysis of the residuals and predictive performance in order to identify any weakness obtained in the preceding step, and restrictions are accepted only if they pass diagnostic checks.[44] These include satisfying evidence against non-normality, serial correlation, heteroskedasticity, model misspecification and structural instability.

The performance of this modelling technique has recently been assessed for its ability to recover the DGP through a Monte Carlo study by Hoover and Perez (1999).

[44] See Hendry and Richard (1982), Gilbert (1986), Ericsson, Campos and Tran (1990), Charemza and Deadman (1992), Hendry (1995) and Campos, Ericsson and Hendry (2005) for more detailed expositions on the general-to-specific modelling technique.

They find that the technique is able to recover the correct specification, or a closely related specification, most of the time. Extending their investigations to cross-section datasets, Hoover and Perez (2004) find an equally impressive performance for this technique.

4.5 Conclusions

This chapter discusses the data sources and the construction of variables that will be used in this study in order to set the stage for the ensuing empirical analyses in Chapters 5 to 9. The Autoregressive Distributed Lag (ARDL) bounds procedure is proposed as the cointegration test. The unrestricted error-correction model is adopted, which accounts for omitted lagged variable bias. To estimate the long-run relationship, an instrumental variable technique is used so that reliable inference can be drawn from the estimates. The general-to-specific modelling technique is used to simplify the conditional error-correction model. In order to test the robustness of the results and to facilitate their interpretation, all estimations are subject to various diagnostic tests.

CHAPTER 5: FINANCIAL DEEPENING AND ITS DETERMINANTS

5.1 Introduction

This chapter seeks to examine the determinants of financial deepening in Malaysia, with a focus on how real output and financial policies affect financial deepening. Financial deepening is measured by the ratio of private credit to GDP and the ratio of M2 to GDP. To measure the effects of financial sector policies, two different measures are proposed – real interest rates and an index of financial liberalization.

As part of the emergence of the new theories of endogenous economic growth over the past two decades, there has been a surge of interest in the potential role played by financial deepening in economic development. As discussed in the literature review of Chapter 2, the finance-growth empirical literature is dominated by cross-country analyses. With few exceptions, these studies have consistently shown that financial deepening has a beneficial impact on economic growth. Importantly, most studies have ignored the possibility of reverse causation in the finance-growth nexus. When financial deepening is specified as the dependent variable instead, the country case studies evidence of Demetriades and Luintel (1997, 2001) show that economic development has a positive impact on financial deepening. Hence, although the positive correlation between financial deepening and economic growth is already a stylized fact as verified by many empirical studies, an important and yet somewhat under-researched issue is what determines financial deepening?

Development of the financial system is shaped by financial sector policies. Despite liberalizing interest rates in 1978, the Malaysian financial system continues to operate within the context of repressionist policies through the provision of subsidized credit to certain priority sectors.[45] This chapter addresses the important question of how the effects of government intervention in the financial system have affected development of the financial sector. This question is of significant relevance for the formulation of financial sector policies.[46]

Empirical studies of the effects of financial sector policies on financial deepening have typically used real interest rates as the proxy for financial liberalization,

[45] See Chapter 3 for more details.

[46] For in-depth case studies on financial liberalization in developing countries, see Cheng (1986), Kohsaka (1987), Park (1994), Yusof, Hussin, Alowi, Lim and Singh (1994), Demetriades and Luintel (1996, 2001), Thirlwall and Warman (1997), Sen and Vaidya (1999) and Ariff and Khalid (2000).

where a rise in this measure implies greater liberalization in the financial sector.[47] However, real interest rates may be affected by a number of factors other than changes of policy environment in the financial system, rendering it an inadequate measure of financial liberalization. In a cross-country analysis, where real interest rates are averaged over a long period of time, this problem may not be severe. However, for a country case study in which the time dimension is important, the use of real interest rates as the sole proxy for the level of financial liberalization can be misleading. As De Gregorio and Guidotti (1995) put forward, higher interest rates may reflect a lack of confidence in economic policy and the banking system, or the adoption of a more risky behaviour in investment undertakings, rather than greater financial liberalization. Furthermore, financial liberalization is not restricted to changes in interest rate policies. In the light of these concerns, an index is constructed using the method of principal component analysis to provide a summary of the joint influence of financial policies. This index captures information on various types of financial restraints imposed on the financial system of Malaysia, including interest rate controls, reserve and liquidity requirements and directed credit programs, to measure the extent of financial liberalization.

The chapter proceeds as follows. Section 5.2 provides the motivation of this analysis. Section 5.3 discusses the analytical framework. Data are described in section 5.4. The estimated results are presented and analysed in section 5.5, and the last section summarizes the results.

5.2 Analytical Framework

5.2.1 Financial deepening and economic development

As seen in Chapter 2, expansion in the financial system may be induced by higher per capita income due to higher demand for financial services. This is based on Robinson's (1952) hypothesis that more financial institutions, financial products and services will emerge in response to greater demand for financial services when an economy expands. The cost of financial services involves a significant fixed component so average costs will fall if the volume of transactions increases. As such, wealthier economies have a greater demand for financial services and are more able to afford a costly financial system. This implies that the level of real economy activity crucially affects financial deepening.

[47] See Dekle and Pradhan (1997), Fry (1997) and Demirguc-Kunt and Detragiache (1998).

5.2.2 Financial sector policies

(a) Interest rate restrictions

The McKinnon-Shaw framework suggests that interest rate controls, particularly interest rate ceilings, may distort the economy in several ways. First, it may discourage entrepreneurs from investing in high risk but potentially high-yielding investment projects. Second, financial intermediaries may become more risk averse and offer preferential lending to established borrowers. Third, borrowers who obtain their funds at relatively low cost may prefer to invest only in capital intensive projects. McKinnon (1973) and Shaw (1973) argue in favour of liberalizing the financial sector by way of removing interest rate controls and allowing the market to determine its own credit allocation in order to deepen the financial system.

However, some counter arguments suggest that liberalizing interest rates may not necessarily lead to higher financial deepening. For instance, in the presence of deposit insurance or implicit government guarantee for rescuing troubled banks, the absence of interest rate control may result in overly risky lending behaviour among banks due to moral hazard problems (Villanueva and Mirakhor, 1990; McKinnon and Pill, 1997). Using a dynamic model of moral hazard, Hellmann, Murdock and Stiglitz (2000) show that an increase in banking competition following liberalization of the financial sector (including removing interest rate restraints) may result in a weaker banking system.[48] Studies have also shown that a significant increase in interest rates, which often follows from interest rate liberalization, is systematically related to financial crises (see Demirguc-Kunt and Detragiache, 1998a, b). In fact, Stiglitz (1994) argues that interest rate restraints may lead to higher financial saving in the presence of good governance in the financial system. When depositors perceive restrictions as policies aimed at enhancing the stability of the financial system, they may well be more willing to keep their savings in the form of bank deposits, thereby increasing the depth of the financial system. Hence, the theoretical impact of a change in interest rates on financial deepening is unclear.

(b) Financial liberalization

It is widely recognized that financial liberalization is an integral part of financial deepening. According to the McKinnon-Shaw school of thought, government

[48] See also Caprio and Summers (1993) for a similar argument.

restrictions on the operation of the financial system, such as an interest rate ceiling, directed credit programs and high reserve requirements (dubbed "financial repression"), may hinder financial deepening. This may in turn affect the quality and quantity of investments and retard development in the financial system. In the simple AK model that involves financial factors presented by Pagano (1993), financial restraints (which may include interest rate controls and reserve requirements) reduce the amount of resources available for financial intermediating activities. Similarly, the endogenous finance and growth model developed by King and Levine (1993b) also shows that financial repression may negatively impact on financial deepening.

However, there is empirical evidence that financial liberalization can induce destabilization in the financial system and trigger financial crises in the absence of appropriate accompanying policies, in particular sound macroeconomic policies (see Diaz-Alejandro, 1985; Villanueva and Mirakhor, 1990). For example, the implementation of financial liberalization programs by Latin American countries in the 1970s resulted in a number of bank failures and other bankruptcies. Interest rate soared and the financial systems in these countries were severely undermined. As Arestis and Demetriades (1999) point out, the financial liberalization hypothesis is based on a set of unrealistic assumptions, including perfect competition, perfect information, and a sound institutional framework. The fact that these assumptions are unlikely to hold in practice may explain the failure of the financial liberalization programs undertaken by many developing countries. Therefore, it appears that, in principle, financial liberalization can either induce financial fragility or deepen the financial systems.

5.2.3 Model specification

The empirical specification of the steady-state equation for financial deepening draws upon the theoretical considerations discussed above. Given that real interest rates and the level of financial liberalization may have different impacts on evolution of the financial sector, both variables are included in the financial deepening specification to capture the effects of financial sector policies. The standard approach used in the literature is followed by taking the ratio of private credit to GDP and the ratio of M2 to GDP, denoted as PC_t and MON_t, respectively, as the measures of financial deepening. The model that uses PC_t as the dependent variable is known as Model A whereas the one that estimates for MON_t is referred to as Model B. The same set of regressors is used in each model.

$$\text{Model A}: \quad PC_t = f_A(PGDP_t, FL_t, RI_t, D_{85-86}, D_{97-98}) \qquad (1)$$

$$\text{Model B}: \quad MON_t = f_B(PGDP_t,\ FL_t, RI_t, D_{85-86}, D_{97-98}) \qquad (2)$$

The independent variables, with the expected signs in the parentheses, are given as:

$PGDP_t$	=	real per capita GDP (+)
RI_t	=	real interest rates (?)
FL_t	=	financial liberalization (?)

Except for RI_t, all variables are measured in natural logarithms in the estimation. The above financial deepening specifications include two dummy variables to account for the impacts of the global economic recession in 1985-86 and the 1997-98 Asian financial crisis, defined as:

$$D_{85-86} = \begin{cases} 1 & \text{if } t = 1985-86 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad D_{97-98} = \begin{cases} 1 & \text{if } t = 1997-98 \\ 0 & \text{otherwise} \end{cases}$$

5.3 Data

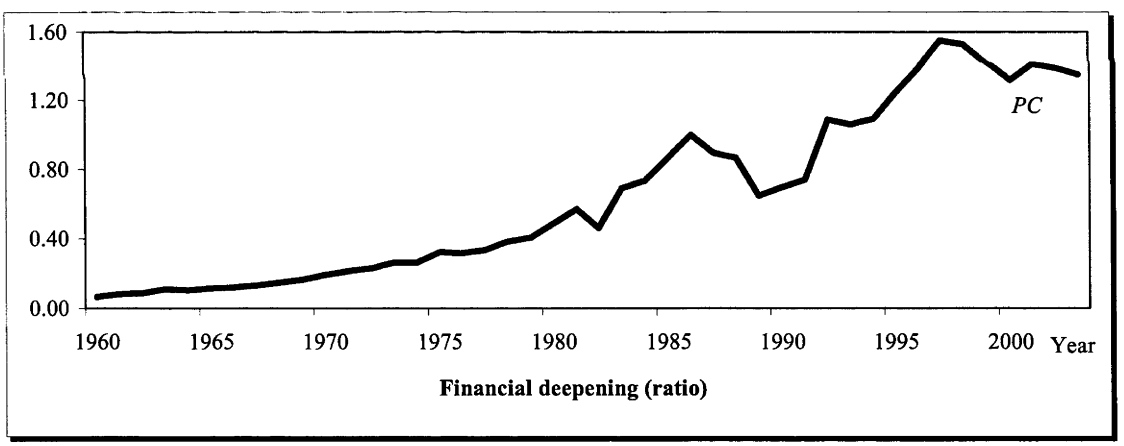
Figure 5.1 presents the series in their original forms (before taking logarithms). It is evident that both financial deepening (indicated by PC_t and MON_t) and the levels of per capita real GDP ($PGDP_t$) have increased significantly over time. All three series are marginally affected by the Asian financial crisis.

Real interest rates (RI_t) have been stable in most periods except for the plunge that took place in the period 1973-74. This was the outcome of the first oil crisis that hit Malaysia in 1973, and subsequently led to a hike in price levels. However, the series rebounded within a short period of time, and has remained fairly stable since. Hence, it appears that Malaysia did not experience any sharp fluctuations in real interest rates following interest rate liberalization in 1978. During the Asian financial crisis period, RI_t increased initially when BNM raised the inter-bank interest rates to prevent the Ringgit from falling, but it declined sharply following a change of the interest rate policy adopted by BNM.

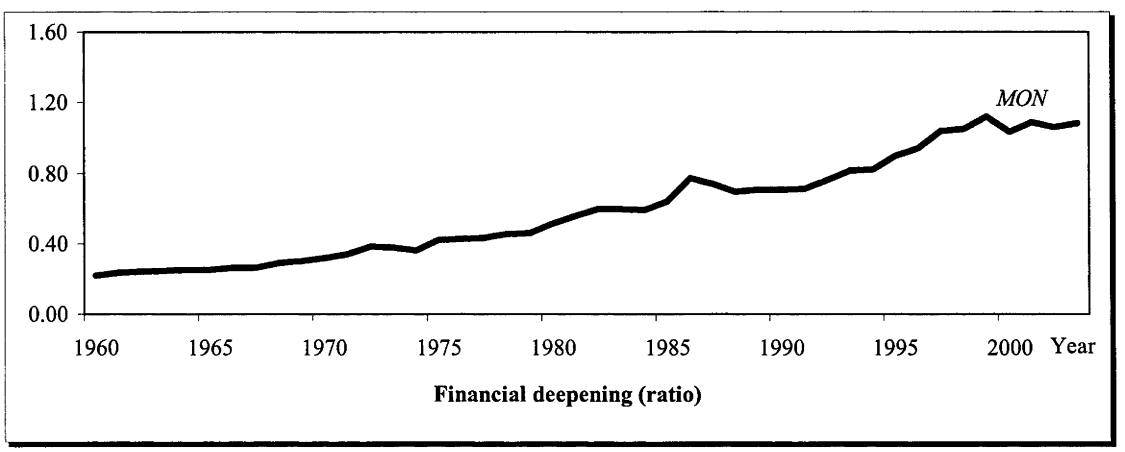
The construction of the financial liberalization index has been explained in Chapter 4. A rise in the financial liberalization index indicates an increase in financial liberalization whereas the reverse implies a greater extent of financial repression. Interestingly, the index coincides rather well with the policy changes that took place in Malaysia during the sample period. It is evident that the extent of financial liberalization from 1960 to 1970 appears to be quite moderate. However, the index begins to move

downwards from 1971 onwards mainly due to an increase in the statutory reserve ratio. 1975 saw a plunge in the index, coinciding with the implementation of directed credit programs. During that year, at least 50 per cent of the total lending made by banks had to be advanced to the *bumiputra* (native Malay) community. The extent of financial repression was subsequently mitigated when the target rate was reduced to only 20 per cent in 1976, and was not implemented in 1977. The decline in 1978 primarily reflects the reintroduction of this policy. A major reform in interest rate policy occurred in late 1978 when the central bank allowed banks to determine their own interest rates. 1985 saw another small reduction in the level of financial liberalization when the liquidity ratio was raised and banks were required to peg their interest rates with the two leading domestic banks. The pegged interest rate regime was later abolished in 1987. The index was fairly stable before the onset of the Asian financial crisis. In 1997, several interventions on interest rates were introduced to mitigate the impact of the crisis. After the crisis, there were signs that liquidity controls were loosened through a significant reduction in the statutory reserve ratio.

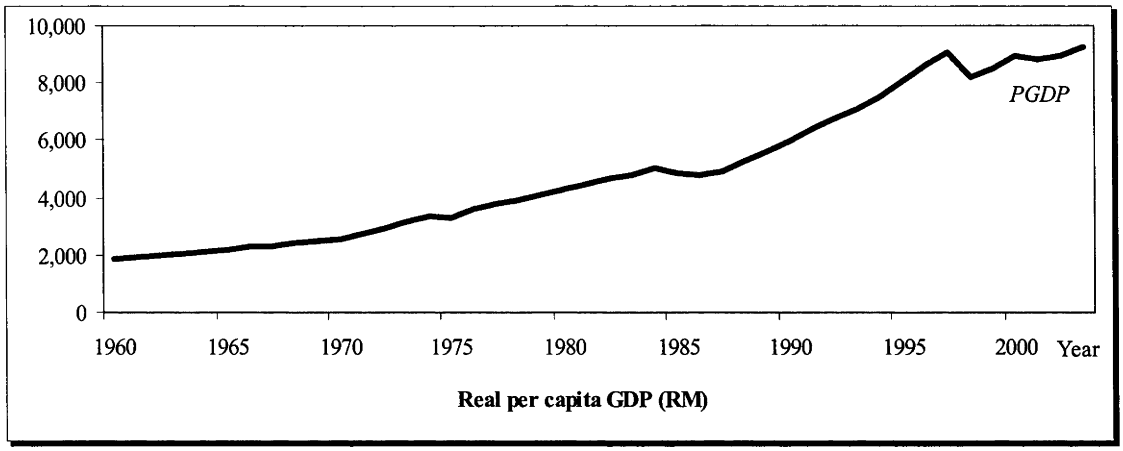
Figure 5.1: Time series plots of variables



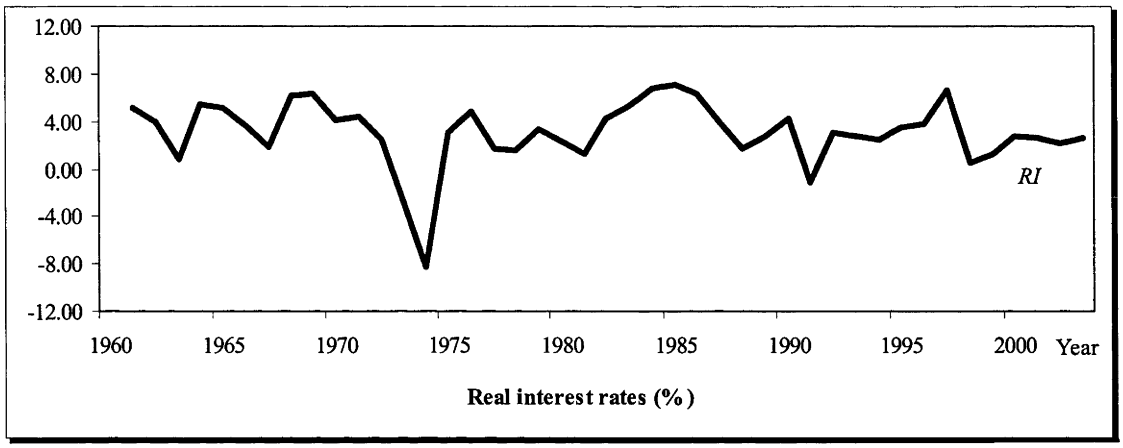
Notes: PC = bank credit to the private sector/GDP.



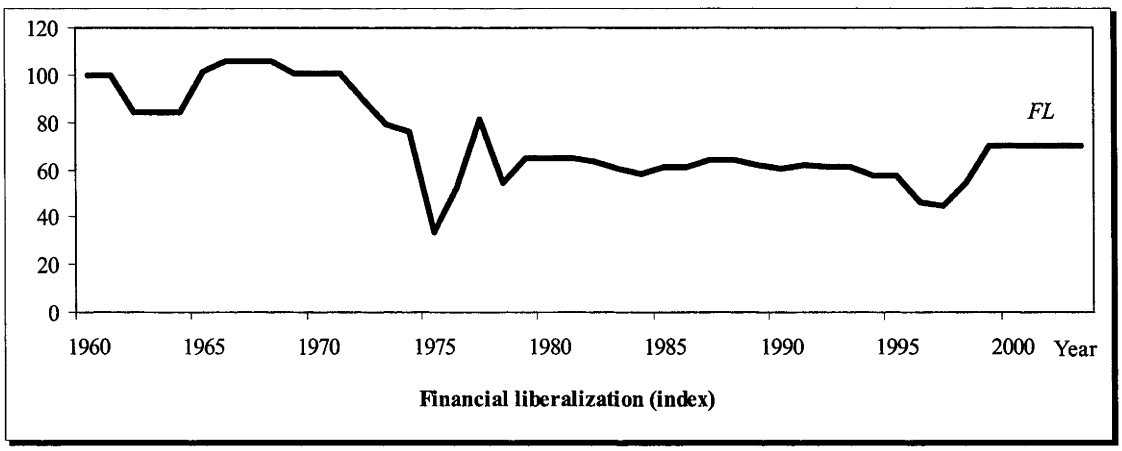
Notes: MON = broad money M2/GDP.



Notes: PGDP = per capita gross domestic product measured in 1987 constant prices.



Notes: RI = 12-month commercial banks deposit interest rate - inflation rate (constructed by CPI).



Notes: FL is constructed by taking the joint influence of interest rate policies, statutory reserve and liquidity requirements, and directed credit programs into consideration using the technique of principal component analysis. See Chapter 4 for more details.

5.4 Results

5.4.1 ARDL cointegration test

The unit tests provided in Appendix 7 show that all variables used in the estimation are either $I(0)$ or $I(1)$. Given that none of the variables appears to be

integrated at an order higher than one, this allows legitimate use of the ARDL bounds procedure.

Table 5.1: ARDL bounds tests and lag length selection

	Model A (Dep. = $\Delta \ln PC_t$)		Model B (Dep. = $\Delta \ln MON_t$)	
	$p=1$	$p=2$	$p=1$	$p=2$
	ARDL bounds tests			
F-statistic	5.058**	2.316	3.981*	1.684
t-statistic	-4.133**	-2.743	-3.698*	-1.981
	Lag length selection criteria			
AIC	-1.305	-1.119	-3.191	-3.074
SBC	-0.719	-0.359	-2.606	-2.314

*Notes: p is the optimal lag length for the conditional ECM. $AIC = -2(ll/T) + 2(k/T)$ and $SBC = -2(ll/T) + (k/T)(\ln T)$, where ll is the maximized log-likelihood value of the model at lag p, k is the number of estimated coefficients, and T is the sample size. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (2001), and the null hypothesis is that there is no long-run relationship.*

To perform the ARDL bounds test, a conditional ECM is estimated with one and two lags for each model. Table 5.1 gives the F- and t-statistics for the ARDL bounds tests, as well as the Akaike's and Schwarz's Bayesian Information Criteria (denoted by AIC and SBC, respectively). Ascertaining the existence of a level relationship between the variables requires satisfying both the F- and the t-tests. The results indicate that the null hypothesis that there exists no level financial deepening equation is rejected at the 10% significance level for both models when only one lag is chosen. In line with the results of the bounds test, both AIC and SBC prefer a simpler dynamic specification of one lag.

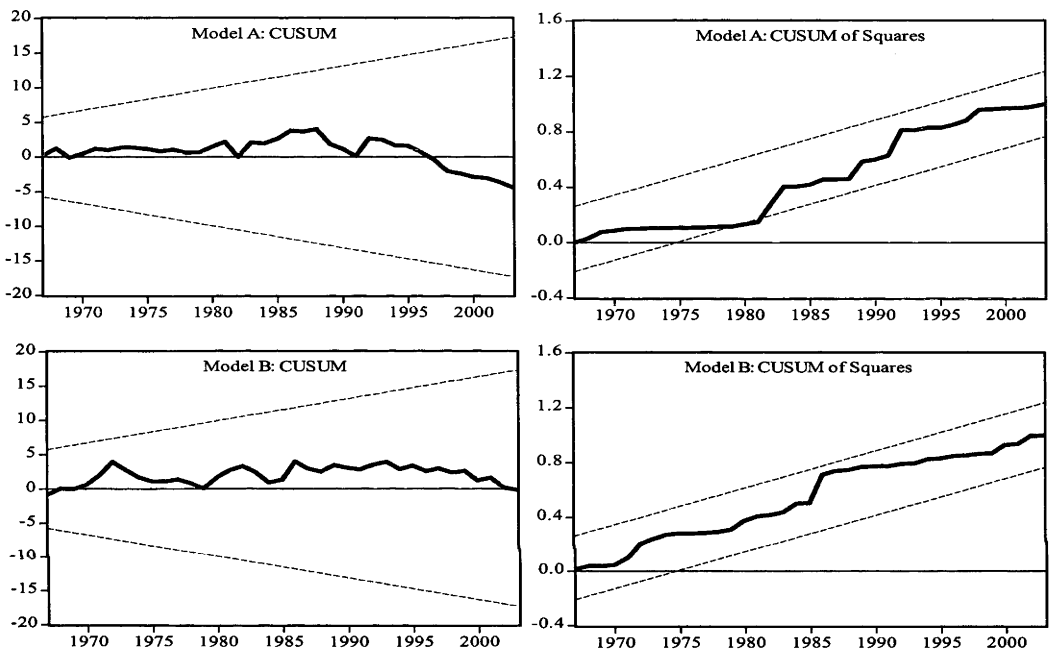
5.4.2 Diagnostic checks

The regression specifications reported in panel B of Table 5.2 fit remarkably well and pass the diagnostic tests against non-normal residuals, serial correlation, autoregressive conditional heteroskedasticity, heteroskedasticity and the regression specification error test (or Ramsey's RESET test), at the 5% level of significance.

The structural stability of the conditional ECM is examined using the cumulative sum (henceforth, CUSUM) and CUSUM of squares tests on the recursive residuals. The

CUSUM test is able to detect systematic changes in the regression coefficients whereas the CUSUM of squares test is able to detect sudden changes from the constancy of the regression coefficients (Brown, Durbin and Evans, 1975). Figure 5.2 shows that the statistics lie within or on the 5% confidence interval bands in both models throughout the sample period, suggesting no structural instability in the residuals of the financial deepening equations.

Figure 5.2: Plots of CUSUM and CUSUM of squares recursive residuals



5.4.3 The long-run relationship and short-run dynamics

Panel A of Table 5.2 provides estimates of the long-run equilibrium relationships, whereas panel B gives the results of the short-run dynamic models. To obtain the long-run model, an unrestricted ECM is estimated by an IV estimator. Based on the results reported in Table 5.1, the estimation begins with one lag and the insignificant terms are systematically dropped. The first lags of the variables have been used as the instruments for the current differenced terms in order to obtain valid standard errors in the presence of endogenous explanatory variables. The conditional ECM associated with the above long-run level relationship is estimated by OLS and reported as the short-run dynamic model in panel B of Table 5.2. The error-correction term was obtained by rearranging the terms in the long-run relationships and lagging by one period. In other words, it is the residuals from the levels regressions reported in

panel A lagging by one period, designed to capture the financial deepening evolution process by which agents adjust for prediction errors made in the last period.

Table 5.2: Long-run and short-run results of the financial deepening equations

	A. The long-run equilibrium level relationship			
	Model A (Dep. = $\ln PC_t$)		Model B (Dep. = $\ln MON_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	-11.415***	0.000	-7.975***	0.000
$\ln PGDP_t$	1.582***	0.000	0.949***	0.000
$\ln FL_t$	-0.648***	0.000	-0.144**	0.015
RI_t	0.054***	0.000	0.017***	0.004
	B. The short-run dynamic model			
	Model A (Dep. = $\Delta\ln PC_t$)		Model B (Dep. = $\Delta\ln MON_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	0.044**	0.016	0.032***	0.004
ECT_{t-1}	-0.447***	0.000	-0.403***	0.000
$\Delta\ln FL_t$	-0.366***	0.002	-0.128***	0.006
ΔRI_t			0.004	0.118
ΔRI_{t-1}	-0.010	0.191		
$\Delta\ln PGDP_{t-1}$			-0.563**	0.020
Diagnostic checks	Test-statistic	*p*-value	Test-statistic	*p*-value
$\chi^2_{NORMAL}(2)$	2.378	0.305	5.279	0.071*
$\chi^2_{SERIAL}(1)$	0.223	0.637	0.036	0.849
$\chi^2_{SERIAL}(2)$	1.273	0.529	0.222	0.895
$\chi^2_{ARCH}(1)$	0.014	0.906	0.819	0.365
χ^2_{WHITE}	5.076	0.534	6.083	0.638
$\chi^2_{RESET}(1)$	1.522	0.217	0.042	0.837

*Notes: The regressions for the long-run model are based on an unrestricted ECM, and corrected for both omitted lagged variable bias and endogeneity bias. The regressions for the short-run dynamic model are based on a conditional ECM. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.* $\chi^2_{NORMAL}(2)$ *refers to the Jarque-Bera statistic of the test for normal residuals,* $\chi^2_{SERIAL}(1)$ *and* $\chi^2_{SERIAL}(2)$ *are the Breusch-Godfrey LM test statistics for no first and second order serial correlation, respectively,* χ^2_{WHITE} *denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients,* $\chi^2_{ARCH}(1)$ *is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and* $\chi^2_{RESET}(1)$ *is the Ramsey's test statistic for no functional misspecification.*

As is evident, all variables enter the long-run equations in panel A significantly at the 5% level. The signs and magnitudes of the coefficients appear reasonable. Although the magnitudes of all estimated coefficients are smaller in Model B, the qualitative aspect of the results remains largely unchanged. While increases in real GDP and real interest rates have a positive impact on financial deepening, an increase in the

extent of financial liberalization does the opposite. The results highlight the following points.

Firstly, the long-run elasticity of financial deepening with respect to output is found to be 1.582 in Model A and 0.949 in Model B. The results imply that the process of financial deepening in Malaysia has been shaped by a higher level of economic activity, which results in higher demand for financial services. Such a finding corroborates the empirical evidence of several studies, including Demetriades and Luintel (1997, 2001) and Arestis, Demetriades, Fattouh and Mouratidis (2002). Since higher output serves to deepen the financial system, greater efforts by the government are necessary to ensure sustained development in the economy.

Secondly, the long-run elasticities of financial deepening with respect to financial liberalization are found to be -0.648 and -0.144 for Model A and Model B, respectively. The results corroborate those of Arestis and Demetriades (1997) and Demetriades and Luintel (2001) for the Korean experience, and Arestis, Demetriades, Fattouh and Mouratidis (2002) for both Egypt and the Philippines. However, the results stand in sharp contrast to those of Ang and McKibbin (2007).

Ang and McKibbin (2007), henceforth A-M, find that financial liberalization has a favourable effect in stimulating financial deepening in Malaysia. The notable differences between the results reported in this chapter and those in A-M may be due to the following: 1) A-M focus on testing the Granger causal relationship between economic growth and financial development whereas the main objective of this chapter is to examine the determinants of financial deepening; 2) while A-M adopt the VAR methodology, the present study considers the single equation ARDL procedure to derive the long-run estimates; 3) all underlying variables are found to be $I(1)$ in A-M whereas the current study find real interest rates to be $I(0)$ and per capita real GDP to be either $I(0)$ or $I(1)$; 4) to provide a more complete characterization of the extent of financial repression in Malaysia, the current study also considers the policy intervention rate, which was introduced after the Asian financial crisis; 5) A-M use real lending rates whereas this study uses real deposit interest rates as the measure of real interest rates; 6) domestic credit to private sector/GDP and M3/GDP are used in A-M as the indicators of financial deepening, but the present study uses bank credit to the private sector/GDP and M2/GDP. The second set of measures is consistently lower than the first, and their gap has been widening rapidly since the early 1990s.

The results imply that the financial constraints imposed on the Malaysian financial system seem to have helped deepening the financial system. This finding is

plausible and accords well with the market structure of the banking system in Malaysia. Compared to other more advanced financial systems, the market concentration ratio in Malaysia is rather high since market capitalization is highly concentrated in the hands of the ten largest banks. This implies that banks in Malaysia may act like a cartel and behave as a monopolist, as suggested by Stiglitz (1994). Using a simple monopoly bank model, Demetriades and Luintel (2001) have shown that financial repression, which may occur through imposing interest rate ceilings, will deepen the financial systems in this situation.

As conjectured by Demetriades and Luintel (1997, 2001), the success of financial sector policies may depend on the effectiveness of the institutions that implement them. In the case of Malaysia, this positive impact may also be due to the presence of a sound central bank, which has enabled the repressionist policies to be carried out effectively and resulted in a favourable effect on the financial system. It is important to note that while a positive effect of financial repression on financial deepening is found, the results do not necessarily recommend repressing the financial system. Nevertheless, the results imply that some form of financial repressionist policies may be conducive to financial deepening in Malaysia.[49]

Thirdly, the results show a positive real interest rates long-run semi-elasticity of 0.054 for Model A and 0.017 for Model B. These effects are small but statistically significant at the 1% level. Our findings of a small positive real interest rates effect are consistent with Demetriades and Luintel (1997, 2001), who find the magnitudes of the coefficients to be in the range 0.002-0.003 for India and Korea. The evidence implies that interest rate liberalization, through removing interest rate controls, has a favourable effect on stimulating financial deepening. Thus, BNM's success in changing the real interest rates from negative to positive levels after the first oil shock in 1973-74 may have mobilized the funds available in the financial system. The results seem to suggest that allowing interest rates to operate in a free market environment has provided greater incentives to save and invest. Since real interest rates appear to have a separate effect on financial deepening, this highlights the importance of treating this variable separately from financial liberalization.

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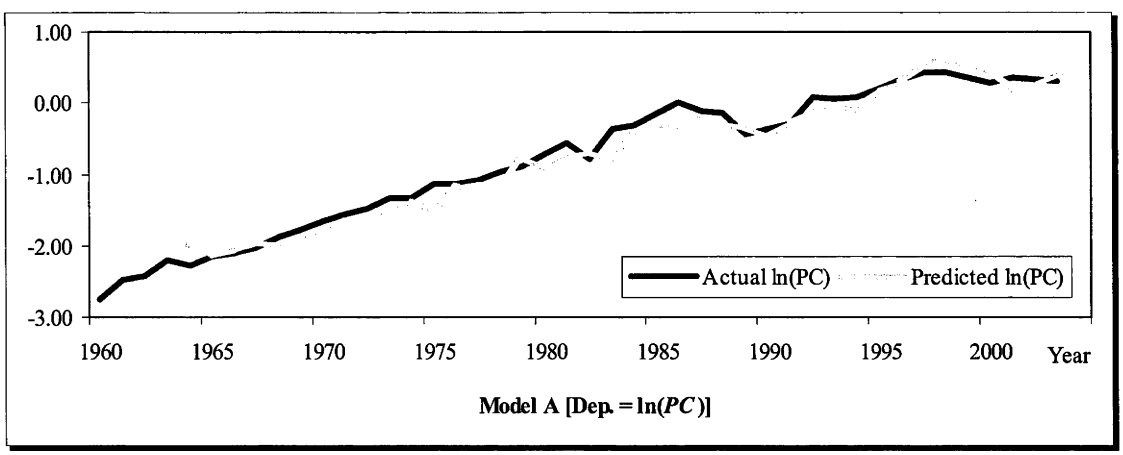
[49] More research is required to provide some insight into this conjecture. To this end, Ang (2007a) has attempted to examine how each type of financial sector policies influences financial deepening in Malaysia. The results indicate that interest rate controls and capital liquidity requirements positively affect the level of financial development. However, higher statutory reserve requirements and the presence of directed credit programs appear to be harmful for development of the Malaysian financial system.

The dummy variables that capture the effects of the global economic recession, i.e., $D_{85\text{-}86}$, and the Asian financial crisis, i.e., $D_{97\text{-}98}$, are found to be statistically insignificant. Therefore, they are dropped from the estimation.

The regression results for the short-run models of $\Delta \ln PC_t$ and $\Delta \ln MON_t$, reported in panel B of Table 5.2, show several desirable features. Except for real interest rate variables, all coefficients are statistically significant at the 5% level. The results imply that changes in real deposit rate do not have any short-run impact on financial deepening. This is probably because deposit interest rate in Malaysia is subject to much regulation, and is therefore less likely to have an impact on financial deepening in the short-run. The results are consistent with Demetriades and Luintel (1997) for the Indian experience. In first-differenced form, ΔFL_t has the appropriate signs, consistent with the results reported in the long-run models.

The coefficients on ECT_{t-1}, which measure the speed of adjustment back to the long-run equilibrium value, are statistically significant at the 1% level and correctly signed, i.e., negative. This implies an error correction mechanism exists.[50] The speed of adjustment at 40.3 to 44.7 per cent a year is considered relatively high. It takes only about two years to achieve long-run equilibrium whenever there is a deviation from the long-run steady state.

Figure 5.3: Actual and predicted financial deepening series



[50] To illustrate, suppose the levels of financial development were too high in the previous period causing a disequilibrium, given the negative coefficient on $\ln PC_{t-1}$ or $\ln M2_{t-1}$, the error-correction mechanism ensures that the current period financial development will fall in order to achieve an equilibrium.

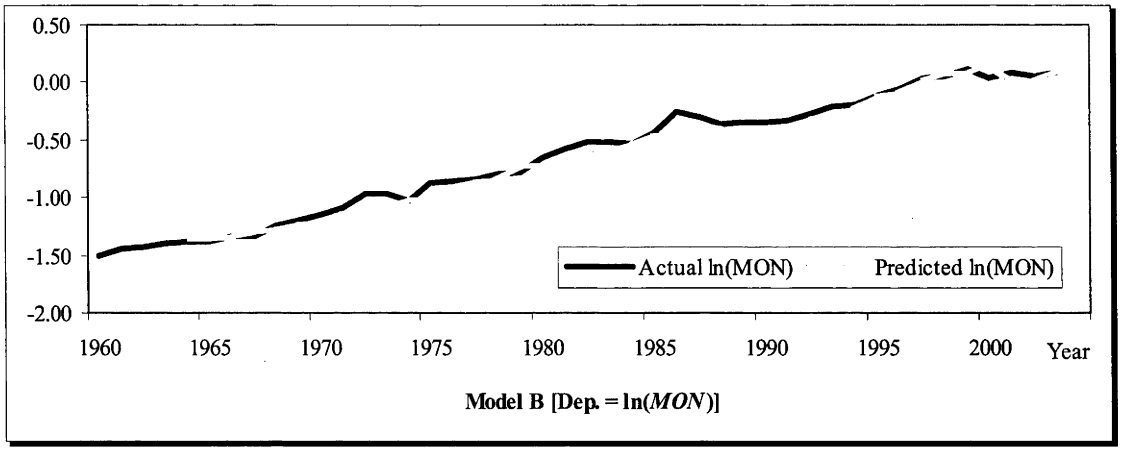


Figure 5.3 shows the actual and predicted levels of financial deepening. Predicted $\ln PC_t$ and $\ln MON_t$ are the long-run (static) equilibrium levels of financial deepening, which are constructed based on the observed variables in the unrestricted ECM. It is evident that the predicted series track the actual series very closely over time for both models.

5.5 Conclusion

This chapter examines the determinants of financial deepening in Malaysia by taking real GDP, real interest rates, and a set financial sector policies into account. Principal component analysis is used to construct a summary measure of financial sector policies to address the difficult problem of measuring the extent of financial liberalization. The results suggest that financial deepening in Malaysia depends on the level of output and the financial sector policies formulated by the government. The evidence provides some support for the efficacy of interest rate liberalization as a device for deepening the financial sector. Financial repressionist policies (including interest rate controls, reserve and liquidity requirements, and directed credit programs) appear to have contributed to development of the Malaysian financial system. Hence, financial liberalization seems to have a direct negative effect on financial deepening, separate from the influence through real interest rates.

CHAPTER 6: THE PATTERNS AND DETERMINANTS OF PRIVATE SAVING

6.1 Introduction

The objective of this chapter is to examine the determinants of private saving in Malaysia. As was outlined in Chapter 3, the saving record in Malaysia has been very impressive over the past few decades. Hence, the focus in this chapter is on what are the key macroeconomic and financial determinants driving the high saving record in Malaysia? The understanding of saving behaviour provides a critical insight into how financial development is linked to economic growth, which is the central issue examined in this thesis.

This study uses the life cycle theory as the cornerstone in constructing the analytical framework while taking into consideration other important aspects, including EPF saving contribution, financial development, and fiscal policy to account for the structural and institutional features of the Malaysian economy. A forced savings in the form of compulsory contribution by employees to a broad based EPF scheme makes up a significant proportion of total private savings in Malaysia (see Chapter 3 for more details). As such, it is important to study for private saving with and without EPF contributions to avoid aggregation bias. Focusing on the component of voluntary private saving enables a closer look at the behaviour of private saving, since the proportion of forced saving in private saving is determined by government policy. Notwithstanding the increasing importance of EPF in Malaysia, no known study has been conducted to analyse how the presence of EPF saving affects the evolution of private saving and voluntary private saving. The analysis provided in this chapter is an attempt to fill this gap in the literature.

The chapter is arranged as follows: section 6.2 sets out the analytical framework, drawing upon the life cycle hypothesis. Appropriate modifications and extensions to the life cycle model are introduced. Data are described in section 6.3. Section 6.4 presents and analyses the empirical results. Finally, the last section summarizes the findings.

6.2 Analytical Framework

In an empirical study of this nature, there is always a trade-off between estimating a specification derived directly from theoretical consumption/saving optimization models, and a reduced-formed specification obtained by incorporating

many saving determinants (Agenor and Montiel, 1999; Loayza, Schmidt-Hebbel and Serven, 2000). In this study, an approach is taken to strike a balance between these two considerations. That is, in order to encompass a sound theoretical underpinning on the determinants of saving while taking into account the structural characteristics of Malaysia, the empirical specification is derived using the Life Cycle model (henceforth LCM) augmented with certain key macroeconomic features of Malaysia, rather than adhering to any narrow model of consumption/saving. The LCM, which is the model most frequently used in the studies of saving determinants, can be extended to consider many other aspects, such as financial deepening, social security programs, and government saving. The LCM has the flexibility of incorporating these additional features without changing its basic insight (Deaton, 2005; Jappelli, 2005).

6.2.1 The "stripped down" LCM

In the LCM, the primary motive for saving is to accumulate financial resources for retirement. Individuals tend to smooth out consumption over their lifetime by saving more during good times and less during bad times. The basic model is based on two key assumptions: the utility function is homogenous with respect to consumption at different points in time, and the individual neither expects to receive nor desires to leave any inheritance (Ando and Modigliani, 1963; Modigliani, 1986). These two assumptions together imply that in any given year t, total consumption (c_t^T) of an individual at age T will be proportional to the present value of total resources (v_t^T) accruing to him over his lifetime, or:

$$c_t^T = \delta_t^T v_t^T \tag{1}$$

In this equation, δ_t^T is a proportional factor that depends on the functional form of the utility function, the rate of return of assets, and the present age of the individual. The present value of resources at age T is the sum of present income (y_t^T), plus income the individual expects to earn over his remaining earning life (ey_t^T), and his net worth carried over from the previous period (a_{t-1}^T).

$$v_t^T = y_t^T + \sum_{i=t+1}^{t+(N-T)} \frac{ey_i^T}{(1+r)^{i-t}} + a_{t-1}^T \tag{2}$$

where N is retirement age and r is the rate of return on assets. The average annual expected income can be expressed as:

$$ey_t^T = \frac{1}{N-T}\left(\sum_{i=t+1}^{t+(N-T)} \frac{ey_i^T}{(1+r)^{i-t}}\right) \tag{3}$$

Using Eq. (1) to Eq. (3), the following expression of total consumption is obtained:

$$c_t^T = \delta_t^T y_t^T + \delta_t^T (N-T) ey_t^T + \delta_t^T a_{t-1}^T \tag{4}$$

If the value of the proportional factor (δ_t^T) is identical across all individuals in a given age group *T*, it is easy to aggregate Eq. (4) over an age group to obtain:

$$C_t^T = \delta_t^T Y_t^T + \delta_t^T (N-T) EY_t^T + \delta_t^T A_{t-1}^T \tag{5}$$

where C_t^T, Y_t^T, EY_t^T and A_{t-1}^T are the corresponding aggregates for the age group *T* of c_t^T, y_t^T, ey_t^T and a_{t-1}^T. Finally, aggregating all age groups, the consumption function for the whole community is obtained:

$$C_t = \alpha_1 Y_t + \alpha_2 EY_t + \alpha_3 A_{t-1} \tag{6}$$

where C_t, Y_t, EY_t and A_{t-1} are obtained by summing respective C_t^T, Y_t^T, EY_t^T and A_{t-1}^T over all age groups *T*. Since expected income is not directly observable, it is convenient to assume $EY_t = \beta Y_t$ and $\beta \approx 1$ so that:

$$C_t = \alpha' Y_t + \alpha_3 A_{t-1} \tag{7}$$

where $\alpha' = \alpha_1 + \beta\alpha_2 \approx \alpha_1 + \alpha_2$. The saving function is, therefore, given as:

$$S_t = (1-\alpha')Y_t - \alpha_3 A_{t-1} \tag{8}$$

According to this model, one of the key determinants of saving is the growth rate of per capita income (Modigliani, 1966, 1970, 1986; Modigliani and Brumberg, 1954; Modigliani and Cao, 2004). As income grows, the life earnings and consumption of each successive age group will be larger than for the preceding group. If each successive age group is aiming for a higher level of consumption in retirement, the aggregate saving of those working relative to those not earning income would increase. Therefore, saving will tend to rise with income growth, given that the higher the growth rate of income, the greater the gap between the targeted levels of consumption of the workers in the current generation and the dissaving of retirees from a less well-off generation.

The LCM focuses on income growth, with little attention paid to the role of income level. This is based on the assumption that households are forward looking, and therefore base their savings decision on lifetime income rather than current income. However, this assumption may not be applicable to a developing country like Malaysia.

As Modigliani (1993) notes, the portion of population that lives at subsistence level may find it too burdensome to set aside additional resources now for future consumption. Therefore, for countries with low per capita income, saving tends to rise with the level of income. For this reason, both income growth and income level are taken into consideration in this analysis of saving behaviour in Malaysia.

In the life cycle setting, the age structure of the population has a direct impact on saving behaviour. Individuals will have negative saving when they are young and when they are old, whereas positive saving occurs during their productive years. That is, saving follows a hump-shaped pattern over an individual's lifetime. At an aggregate level, aggregate saving might be expected to be lower when there are more dependents in an economy. Hence, higher age dependency in the population tends to reduce saving.

Another important determinant of saving implied by the LCM is real interest rates. How real interest rates affect saving is unclear in the model. Whether saving responds positively or negatively to real interest rates depends on the relative magnitude of the substitution and income effects. Higher interest rates may induce more saving due to the higher price of present consumption relative to the future price (substitution effects); but it may also reduce saving if the individual is a net lender (income effects). These two effects may offset each other. Furthermore, as postulated by Ogaki, Ostry and Reinhart (1996), a change in real interest rates may not have any impact on saving if household income levels in poor countries are close to the subsistence level. Hence, the impact of real interest rates on saving is theoretically ambiguous.

6.2.2 Modifications and extensions

The empirical implementation of the basic model described above raises several issues, which are discussed in the following.

(a) Pension saving

A key limitation of the LCM is the assumption that individuals are able to make rational decisions in developing a lifetime plan of consumption and saving. However, in practice, many workers are unable to enter retirement with sufficient financial resources (Lesnoy and Leimer, 1985). In fact, this was the main reason for the introduction of the social security program in Malaysia. The analysis provided in Chapter 3 clearly highlights the need to capture the effects of pension saving, given that it is a key driver in the Malaysian financial system that mobilizes a lot of saving.

The importance of social security on the behaviour of saving has been highlighted in an early study by Friedman (1957), and later formally incorporated into the analysis of the LCM by Feldstein (1974) and Munnell (1976).[51] This new LCM proposes that the presence of a sound social security framework effectively reduces the amount of saving during the working years. This is because if savers perceive they will receive high pension benefits at the point of retirement, they will tend to reduce the amount saved during their working lives, weakening the precautionary motive for saving. Hence, in principle, an increase in the perceived benefits of pension saving reduces the desire to accumulate financial assets, and may therefore discourage household saving (Feldstein, 1980; Evans, 1983).

Given this consideration, the model set out in section 6.2.1 is modified to capture the effects of pension coverage. Expected pension benefits after retirement (pen_t^T) are considered as part of the total resources of the individual. Thus, Eq. (2) can be rewritten as:

$$v_t^T = y_t^T + \sum_{i=t+1}^{t+(N-T)} \frac{ey_i^T}{(1+r)^{i-t}} + a_{t-1}^T + \sum_{i=t+1}^{t+(D-N)} \frac{pen_i^T}{(1+r)^{i-t}} \tag{9}$$

where D is age of death. Average annual expected pension benefits can be written as:

$$pen_t^T = \frac{1}{D-N}\left(\sum_{i=t+1}^{t+(D-N)} \frac{pen_i^T}{(1+r)^{i-t}} \right) \tag{10}$$

It follows that the consumption function for the whole community in Eq. (6) can then be expressed as:

$$C_t = \alpha_1 Y_t + \alpha_2 EY_t + \alpha_3 A_{t-1} + \alpha_4 PEN_t \tag{11}$$

and, finally, the modified saving function is given as:

$$S_t = (1-\alpha')Y_t - \alpha_3 A_{t-1} - \alpha_4 PEN_t \tag{12}$$

Although the rationale that higher social security benefits tend to lower the savings rate is clear from the modified LCM, some counter-arguments have been proposed in the literature. As Pechman, Aaron and Taussig (1968) postulate, to the extent that savers are not rational, they may ignore the benefits of social security. Cagan (1965) argues that participation in a social security program has an educational effect, which increases the awareness of savers about the importance of saving for their old age. Similarly, Feldstein (1974) postulates that social security can increase saving by

[51] The approaches adopted by these two studies are identical, although they differ in terms of empirical implementation. Munnell (1976) uses a dummy variable to indicate whether an individual expects to receive social security benefits upon retirement whereas Feldstein (1974) employs actual data on the level of social security benefits entitled by retired workers to capture the effects of social security.

inducing early retirement. This expands the span of retirement years and therefore increases the need for more saving during the working life in order to achieve a targeted level of retirement income. In line with these, Barro (1978) and Barro and MacDonald (1979) argue that individual savers may save more in response to an increase in social security benefits. This is because they may increase bequests to their children in order to compensate for the higher social security taxes borne by future generations.

In sum, social security has dual effects on saving: it lowers saving because it substitutes for household assets, but it also increases saving due to irrational behaviour, educational effects, induced retirements, and inter-generational transfers. Thus, it appears that economic theory provides no *a priori* argument for or against the effects of social security on saving. The net effect depends on the relative strengths of these opposing forces. Hence, the expected sign of this variable is indeterminate and the issue is an empirical one.

(b) Age structure

As highlighted in an important study by Horioka (1997), age dependency should be segregated into young and old age dependency, since they each may have a different bearing on the behaviour of saving. This point has been further developed by Athukorala and Tsai (2003) who argue that with economies of scale in family consumption, large families are able to provide a child with the same amount of welfare with a less than proportionate increase in household expenditures compared to a small family. In addition, when parents intend to increase the family size, they may reduce consumption and save more in anticipation of higher expenditures after births. Thus, young and old age dependency may have different effects on saving and they should be treated separately in the analysis.

(c) Financial deepening

Financial deepening may induce more saving through two channels. Firstly, the incentives to save may increase with the proliferation of financial instruments, which can satisfy the diverse needs and portfolio preference of various savers. That is, a greater variety of financial tools can induce individuals to save more since it becomes more convenient to save. Therefore, willingness to save may depend on the degree of sophistication of the financial systems (Goldsmith, 1969; Park, 1994). The second argument is based on Shaw's (1973) financial intermediation view. Shaw argues that the existence of a sophisticated financial system facilitates the intermediation between

savers and investors. More intermediation between savers and investors enhances the incentives to save since an efficient financial system effectively reduces risk and information costs, which can increase net real returns of savers and positively affect saving.

However, financial deepening is also likely to impact negatively on saving. The LCM depends on the ability to borrow when young to smooth out consumption throughout a lifetime. The model assumes a world of perfect capital markets in which credit is easily available. In reality, imperfections in credit markets may prevent households from borrowing as much as they would wish. This may reduce consumption and increase saving (Modigliani, 1986). Financial development takes place when there is an increase in financial intermediating activities, which follows from the removal of credit constraints. Therefore, this implies that the relaxation of credit constraints, which may lead to expanded consumer lending and increased financial development, is likely to result in lower saving. As Liu and Woo (1994) postulate, an insufficient level of financial deepening induces individuals to save more in order to undertake self-financed investment projects. In sum, financial deepening appears to be a double-edged sword with regard to saving.

(d) Public saving

The government can finance fiscal expenditure by issuing bonds. However, it must eventually repay this borrowing by increasing taxes in future. Using an overlapping generations model, Barro (1974) shows that there would be no marginal net-wealth effect of government bonds so long as individuals from one generation can transfer resources to the next generation. This is because households would save more to compensate for the higher taxes they have to pay in future, despite having more disposable income in the present. The model implies that an increase in government debt does not lead to an increase in household wealth, given that tax liabilities can be shifted from one generation to another.

In the analysis of saving behaviour, this hypothesis implies that an increase in government saving will have no effect on total saving, since it will be met by an equal reduction in private saving. That is, when the government runs a budget deficit, the private sector will respond by saving more to offset this undesirable effect on future generations. Hence, any change in public saving will be fully offset by an equal change in private saving. This proposition is based on the assumption of a perfect capital

market where households can borrow as much as they want, widely known as the Ricardian equivalence hypothesis.[52]

6.2.3 The model

The above theoretical considerations lead to formulation of the empirical specification of the saving equations given in Eq. (13) and Eq. (14).[53] Both real private saving (PRS_t) and real voluntary private saving ($VPRS_t$) are estimated using the same set of regressors as follows:

Model A :

$$PRS_t = f_A(PPI_t, RI_t, YAG_t, OAG_t, FD_t, PEN_t, PUS_t, D_{85-86}, D_{97-98}) \quad (13)$$

Model B :

$$VPRS_t = f_B(PPI_t, RI_t, YAG_t, OAG_t, FD_t, PEN_t, PUS_t, D_{85-86}, D_{97-98}) \quad (14)$$

where PRS_t is real private saving and $VPRS_t$ is real voluntary private saving, defined as real private saving net of annual EPF contributions. Notice that the growth rate of per capita real private income ($\Delta \ln PPI_t$) is not included in the long-run specification, but is captured in the short-run conditional error-correction model. The independent variables, with the expected signs in the parentheses, are given as:

PPI_t = per capita real private income (+)

RI_t = real interest rates (?)

YAG_t = young age dependency (–)

OAG_t = old age dependency (–)

FD_t = financial deepening (?)[54]

PEN_t = expected benefits of EPF saving (?)

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[52] The Ricardian equivalence proposition was first proposed by David Ricardo and later popularized by Robert Barro using the theory of rational expectation.

[53] In the savings literature, the most commonly used saving variable is the private saving rate (ratio of private saving to nominal GDP). However, it is important to note that when saving is measured in ratio as $\ln(GNS_t / GDP_t) = \ln(GNS_t) - \ln(GDP_t)$, a restriction of one is imposed on the coefficient for $\ln(GDP_t)$. Such a restriction is a testable hypothesis. If it is not valid statistically, measurement errors will be introduced into the dependent variable. Hence, the focus here is on analysing real private saving rather than the rate of saving.

[54] To measure financial development, the standard practice is to use bank credit to private sector as a ratio of GDP, as discussed previously in Chapter 4. Since the income variable used in the analysis of saving behaviour is private income, financial development is defined as bank credit to the private sector as a ratio of private income in the specification of the saving function. Using an alternative measure of M2/private income, similar estimation results are obtained. This variable can also be used to measure wealth (see Athukorala and Sen, 2002; Athukorala and Tsai, 2003).

PUS_t = real public saving (–)

The variables PRS_t, $VPRS_t$, PPI_t, FD_t, PEN_t and PUS_t are measured in natural logarithms. The above saving specifications include two dummy variables to account for the impacts of the global economic recession in 1985-86 and the 1997-98 Asian financial crisis, defined as:

$$D_{85-86} = \begin{cases} 1 & \text{if } t = 1985-86 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad D_{97-98} = \begin{cases} 1 & \text{if } t = 1997-98 \\ 0 & \text{otherwise} \end{cases}$$

6.3 Data

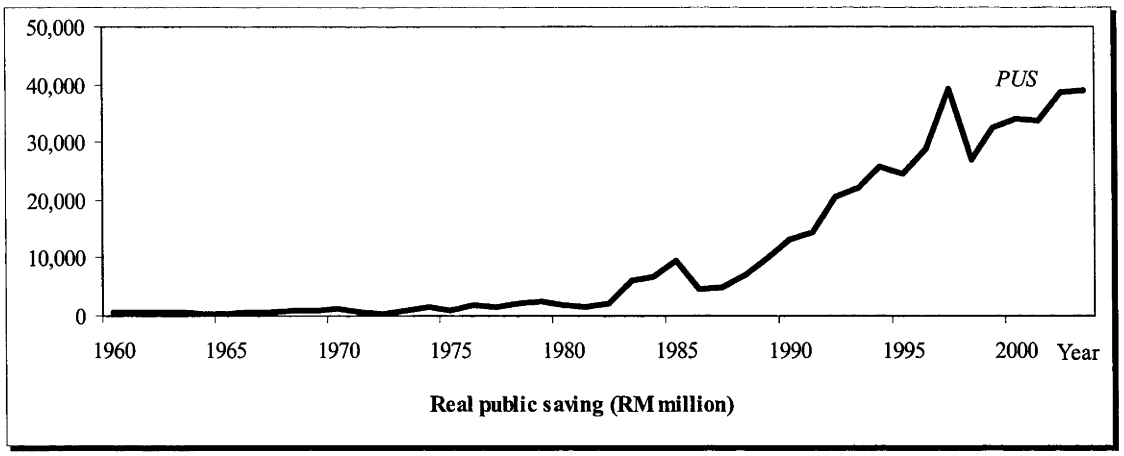
Figure 6.1 displays the evolution of the key variables used in this analysis over the period 1960-2003. The series are presented in their original forms, i.e., before taking logarithms. It is evident that all saving series, i.e., PUS_t, PRS_t, and $VPRS_t$, have increased significantly over time. PUS_t has generally been on the rise over the whole period except for 1998, which coincides with the Asian financial crisis. PRS_t is consistently higher than $VPRS_t$, and the difference between these two series reflects the annual flows of EPF contributions. The gap is increasing over time, reflecting the growing importance of EPF.

While PPI_t shows a persistent increase over time, its expansion slows significantly after the Asian financial crisis. $\Delta \ln PPI_t$, i.e., the growth rate of per capita private income, experienced some fluctuations throughout the last four decades. 1985 saw a plunge in the series as a result of the global economic recession. Two additional contractions are observed in 1997-98 and 2001, coinciding with the financial crisis and the world trade recession, respectively.

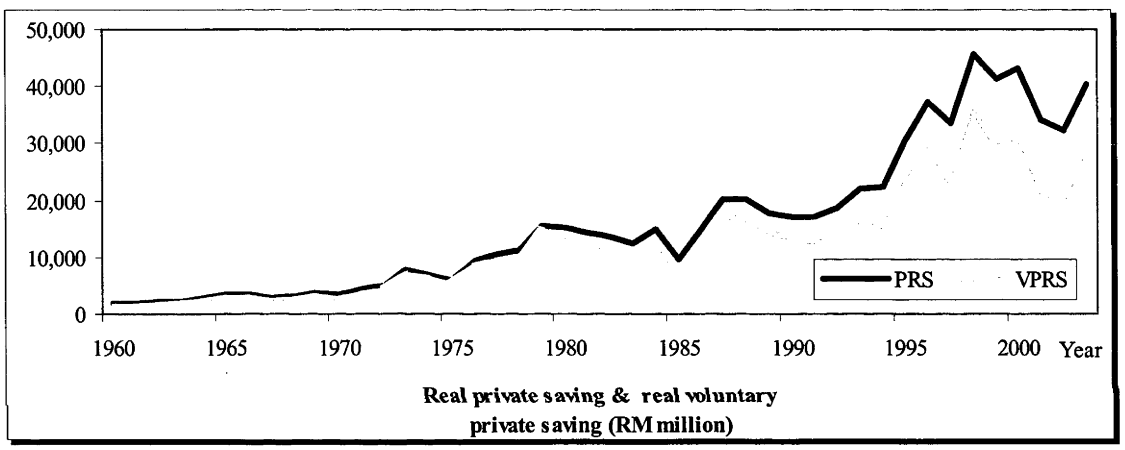
YAG_t and OAG_t show different patterns of development. In the former, the series has shown a declining trend over time. In the latter, while a peak is initially reached in 1975, the series declines sharply before bouncing back in 1991. These patterns of change highlight the importance of treating age-specific saving profiles differently.

PEN_t has increased gradually from 1960 to the early 1970s, before the onset of the first oil crisis. The series rises rapidly during the period 1981-85, but the growth rate slows significantly after the global economic recession in 1985. Since then, the series has been growing at a steady rate before falling in 2000.

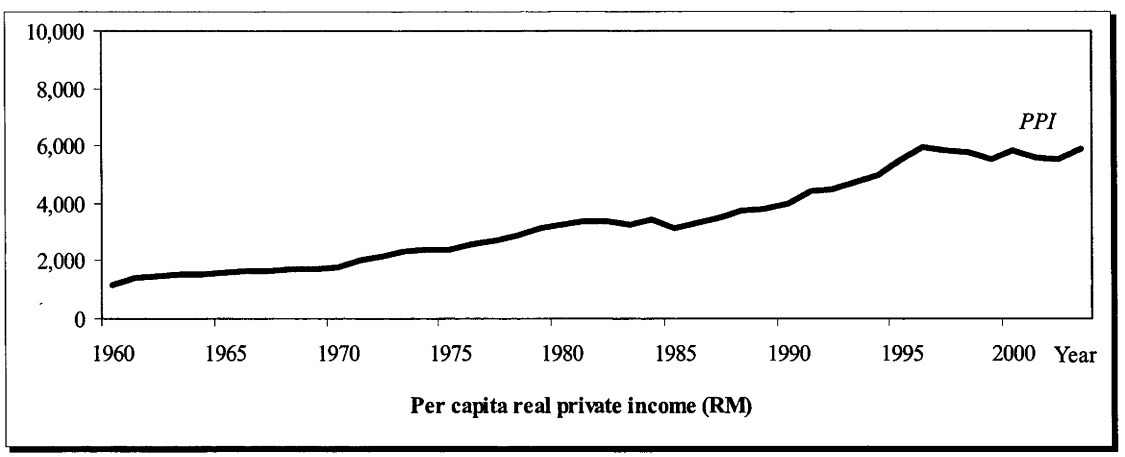
Figure 6.1: Time series plots of key variables



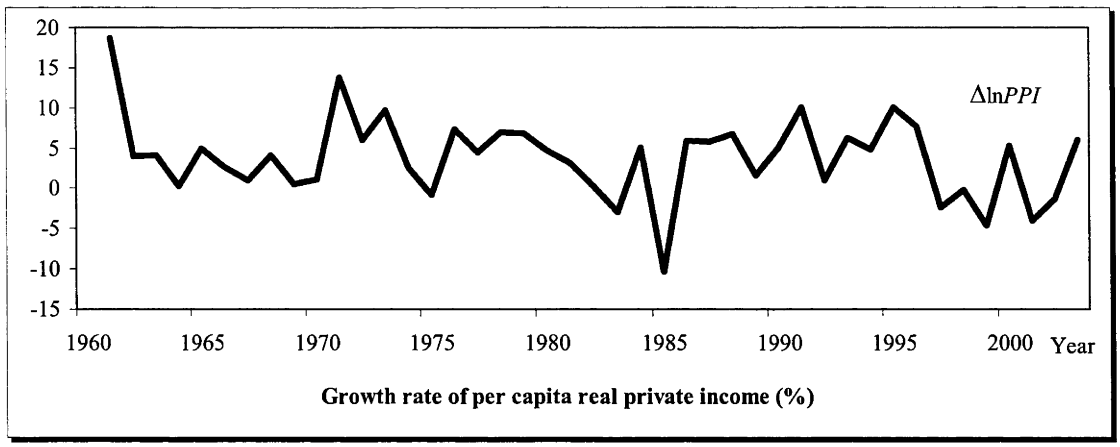
Notes: PUS = (government revenue - operating expenditure + non-financial public enterprise surpluses)/GDP deflator.



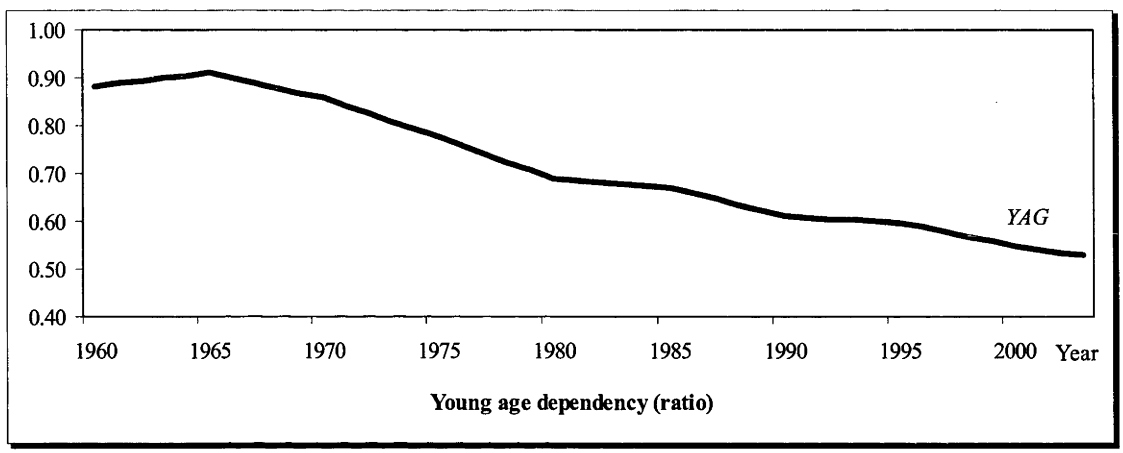
Notes: PRS = (gross national saving - PUB)/GDP deflator; VPRS = (gross national saving - PUB - annual EPF contributions)/GDP deflator.



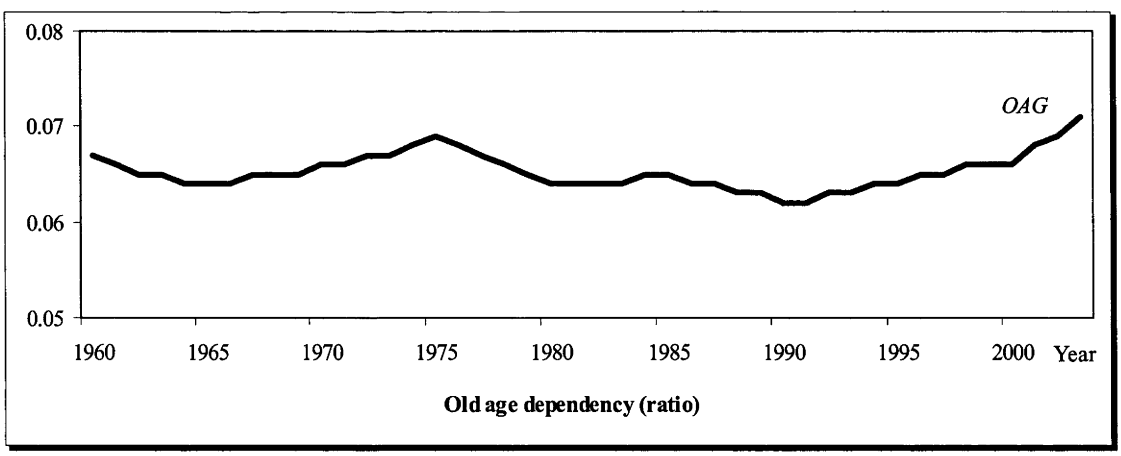
Notes: PPI = (GDP + net factor income payments from abroad - public saving - public consumption)/(population x GDP deflator).



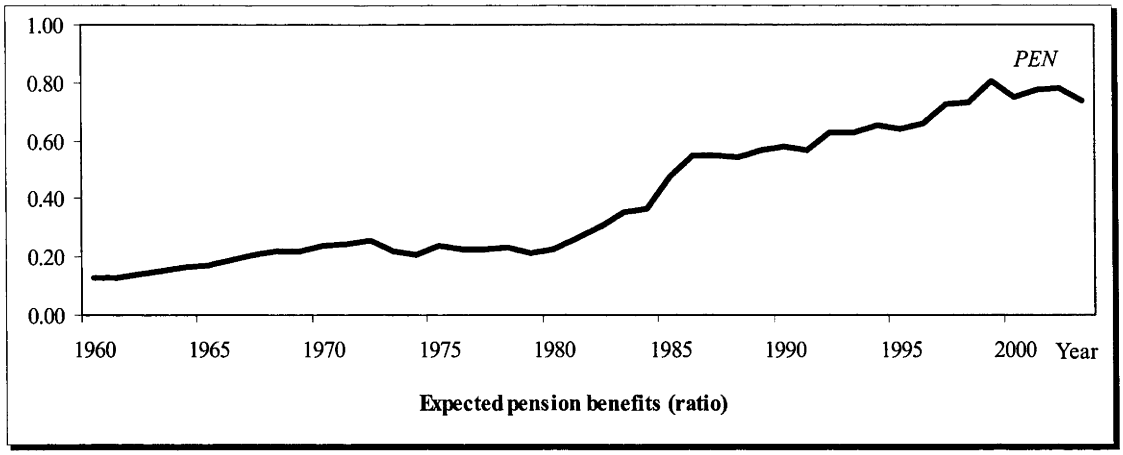
Notes: ΔlnPPI is the first difference of per capita real private income.



Notes: YAG = population ages 0-14/population ages 15-64.



Notes: OAG =(population ages >65/population ages 15-64.



Notes: PEN = cumulative EPF savings/private income.

6.4 Results

6.4.1 ARDL cointegration test

Table 6.1 gives the *F*- and *t*-statistics for the ARDL bounds tests, as well as the Akaike's and Schwarz's Bayesian Information Criteria (denoted by AIC and SBC, respectively). The results indicate that the null hypothesis that there exists no long-run level private saving equation is rejected at the 5% significance level for both Model A and Model B when only one lag is chosen. In terms of lag length selection, AIC suggests two lags whereas SBC prefers one lag for Model A. The results for Model B are in line with the bounds test, which suggest a simpler dynamic specification of one lag.

Table 6.1: ARDL bounds tests and lag length selection

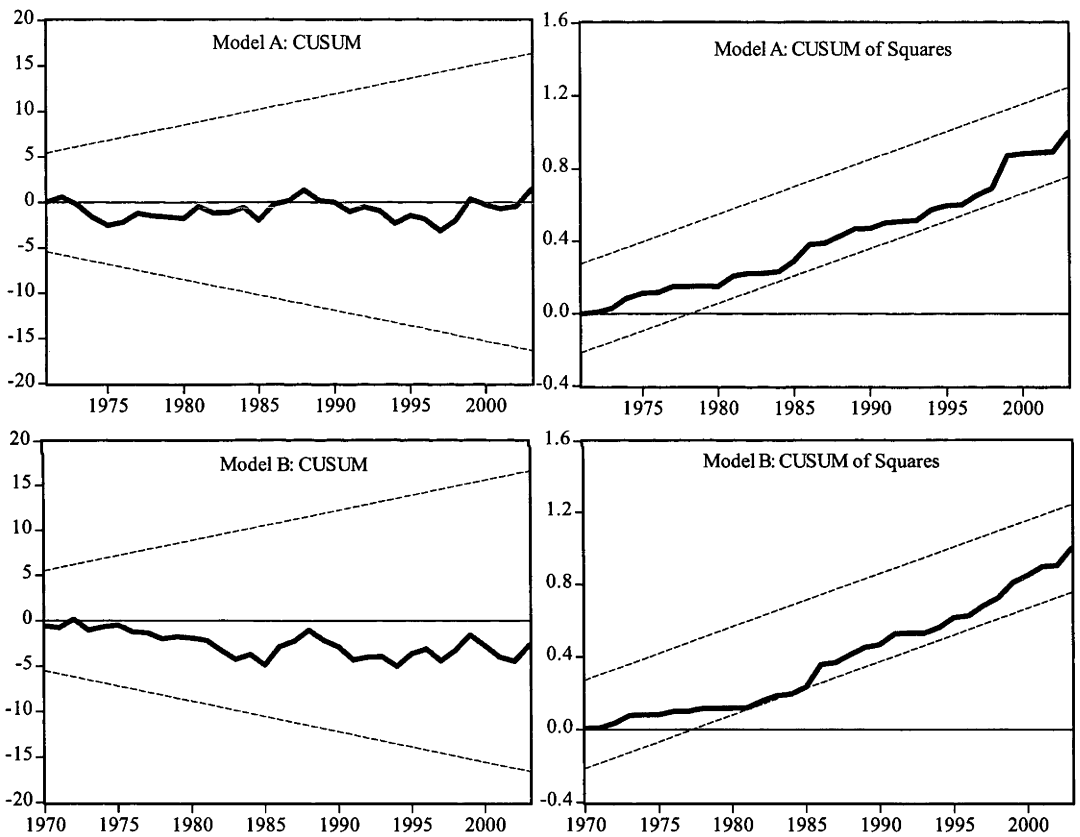
	Model A (Dep. = $\Delta \ln PRS_t$)		Model B (Dep. = $\Delta \ln VPRS_t$)	
	$p=1$	$p=2$	$p=1$	$p=2$
	ARDL bounds tests			
F-statistic	4.552***	1.262	4.558***	1.076
t-statistic	-5.172**	-0.431	-5.207***	-0.705
	Lag length selection criteria			
AIC	-2.148	-2.174	-1.630	-1.511
SBC	-1.061	-0.739	-0.543	-0.075

*Notes: p is the optimal lag length for the conditional ECM. $AIC = -2(ll/T) + 2(k/T)$ and $SBC = -2(ll/T) + (k/T)(\ln T)$, where ll is the maximized log-likelihood value of the model at lag p, k is the number of estimated coefficients, and T is the sample size. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (2001), and the null hypothesis is that there is no long-run relationship.*

6.4.2 Diagnostic checks

The regression specifications reported in Table 6.2 fit remarkably well and pass the diagnostic tests against non-normality, serial correlation, autoregressive conditional heteroskedasticity, heteroskedasticity and the Ramsey's RESET test, at the 5% level of significance. The results of the CUSUM and CUSUM of squares tests on the recursive residuals, presented in Figure 6.2, show no sign of structural instability in the residuals of the private saving equations in both models throughout the period after the 1970s.

Figure 6.2: Plots of CUSUM and CUSUM of squares recursive residuals



6.4.3 The long-run relationship and short-run dynamics

The results reported in panel A of Table 6.2 represent the long-run equilibrium relationships whereas those in panel B show the short-run dynamic models. While some changes are observed in the magnitudes of the estimated coefficients, the qualitative aspect of the results in these two models remains largely unaltered. Except for YAG_t and OAG_t, all variables enter the long-run equations in panel A significantly.

Table 6.2: Long-run and short-run results of the private saving equations

	A. The long-run equilibrium level relationship			
	Model A (Dep. = $\ln PRS_t$)		Model B (Dep. = $\ln VPRS_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	-6.604***	0.010	-7.804***	0.010
$\ln PPI_t$	2.044***	0.000	2.262***	0.000
RI_t	0.015**	0.036	0.023***	0.006
YAG_t	1.035	0.275	1.276	0.266
OAG_t	-1.347	0.912	-11.801	0.457
$\ln FD_t$	0.442***	0.000	0.403***	0.006
$\ln PEN_t$	-0.225**	0.043	-0.310**	0.029
$\ln PUS_t$	-0.125***	0.003	-0.180***	0.001
	B. The short-run dynamic model			
	Model A (Dep. = $\Delta\ln PRS_t$)		Model B (Dep. = $\Delta\ln VPRS_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	-0.011	0.761	0.008	0.853
ECT_{t-1}	-0.825***	0.000	-0.950***	0.000
ΔRI_t	0.011**	0.018	0.020***	0.005
ΔYAG_t	-6.846**	0.034	-5.553*	0.067
ΔOAG_t	-48.134***	0.005	-52.819**	0.023
$\Delta\ln PEN_t$	-1.798***	0.000	-1.893***	0.000
$\Delta\ln PUS_t$	-0.090***	0.002		
$\Delta\ln PPI_{t-1}$			-0.918**	0.015
ΔYAG_{t-1}	7.750**	0.012		
ΔOAG_{t-1}	-63.992***	0.003	-127.219***	0.000
Diagnostic checks	Test-statistic	*p*-value	Test-statistic	*p*-value
$\chi^2_{NORMAL}(2)$	0.797	0.671	2.204	0.332
$\chi^2_{SERIAL}(1)$	0.858	0.354	0.051	0.822
$\chi^2_{SERIAL}(2)$	3.845	0.146	4.884*	0.087
$\chi^2_{ARCH}(1)$	0.297	0.586	0.001	0.994
χ^2_{WHITE}	16.519	0.417	13.417	0.494
$\chi^2_{RESET}(1)$	0.334	0.564	0.994	0.319

*Notes: The regressions for the long-run model are based on an unrestricted ECM, and corrected for both omitted lagged variable bias and endogeneity bias. The regressions for the short-run dynamic model are based on a conditional ECM. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.* $\chi^2_{NORMAL}(2)$ *refers to the Jarque-Bera statistic of the test for normal residuals,* $\chi^2_{SERIAL}(1)$ *and* $\chi^2_{SERIAL}(2)$ *are the Breusch-Godfrey LM test statistics for no first and second order serial correlation, respectively,* χ^2_{WHITE} *denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients,* $\chi^2_{ARCH}(1)$ *is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and* $\chi^2_{RESET}(1)$ *is the Ramsey's test statistic for no functional misspecification.*

Consistent with the predictions made in the LCM, the results show that private saving rises with per capita real private income, with a long-run elasticity of 2.044 for Model A and 2.262 for Model B. This finding is consistent with the results of Yaakop

(1988), Modigliani (1993), Edwards (1996), Thirlwall (1974, 1995), Hussein and Thirlwall (1999), Loayza, Schmidt-Hebbel and Serven (2000), Athukorala and Sen (2002) and Athukorala and Tsai (2003).

A one percentage point increase in the real interest rates leads to only a 0.015 percentage point increase in private saving and a 0.023 percentage point increase in voluntary private saving. The finding of a positive role for real interest rates corroborates the empirical results of Warman and Thirlwall (1994), Athukorala (1998), Masson, Bayoumi and Samiei (1998) and Athukorala and Tsai (2003).

This positive impact on saving implies that substitution effects outweigh income effects. These results are not surprising given that the Malaysian financial system consists of a large number of small depositors with relatively few large lenders. As such, substitution effects are likely to dominate the direction of change following a rise in real interest rates. The evidence seems to suggest that the interest rate reforms adopted in Malaysia have encouraged more saving.[55] However, given that private saving has a low degree of responsiveness with respect to real rates of interest, this implies that liberalizing the interest rates is only a moderately effective tool to spur private saving.

The coefficients of the young age dependency ratio and the old age dependency ratio are found to be statistically insignificant. The results seem to suggest that demographic factors do not have an impact on the behaviour of private saving in the long-run. The finding that demographic variables have no role to play in the determination of private saving in the long-run is consistent with the results of Agrawal (2001) for the Indian experience. Several previous studies have also found evidence that demographic factors have no significant impact on saving. These include Dayal-Ghulati and Thinmann (1997) for the ASEAN and Latin American experience, Masson, Bayoumi and Samiei (1998) in their cross-sectional estimation for 40 developing countries, Bonser-Neal and Dewenter (1999) for 16 emerging markets, Kraay (2000) for the Chinese experience, and Ozcan, Gunay and Ertac (2003) for the Turkish experience. Hence, this finding is not inconsistent with the literature.[56]

Financial deepening is found to have played a beneficial role in the accumulation of saving in the private sector. This coincides with the empirical findings

[55] The major phase of interest rates reforms took place in 1978. For more details, see Chapter 3.

[56] The high collinearity observed between age dependency and the financial deepening indicators may have reduced statistical significance of the demographic variables. This does not affect the short-run results when all variables are expressed in first-differences.

of a number of studies, including Gupta (1987), Fry (1991), Edwards (1996), Hussein and Thirlwall (1999), Athukorala and Sen (2002) and Thirlwall (2002). The long-run elasticity derived from the coefficients on financial deepening suggests a one per cent increase in financial deepening yields about a 0.403 to 0.442 per cent increase in private saving. Insofar as the estimated coefficient represents the private saving effects of a change in the level of financial deepening, the positive sign is consistent with the view that saving rises with a proliferation of financial tools and an improvement in the financial system.

The expected benefits of EPF saving are found to have a negative influence on private saving, with a long-run elasticity of -0.225 for Model A and -0.310 for Model B. The results are compatible with the view that a social security system discourages saving, and corroborates the empirical findings of Munnell (1976), Feldstein and Pellechio (1979), Feldstein (1980), Modigliani and Sterling (1983), Lee and Chao (1988) and Edwards (1996). The results are also in line with Shome and Saito (1980) for the Malaysian experience during the 1970s, and Dayal-Ghulati and Thinmann (1997) for the experience of ASEAN countries (including Malaysia) during the period 1975-95.

The results seem to suggest that development of the pension system in Malaysia, through a higher accumulation of EPF saving, tends to discourage private saving. The results are not surprising given the operation of the EPF in Malaysia. Traditionally, the EPF is only permitted to invest in highly rated financial assets and contributors are not allowed to withdraw their entire pension saving until retirement. Hence, it is likely that the anticipation of receiving secured high pension benefits at the point of retirement reduces the desire to save. This interpretation is consistent with the predictions of the modified LCM.

The results show that a rise in government saving leads to a reduction in private sector saving, suggesting that changes in the government fiscal position have some impacts on private saving. However, public saving seems to crowd out private saving only partially, providing no full support for the Ricardian equivalence hypothesis. The results are in line with a number of empirical studies, including Edwards (1996), Hussein and Thirlwall (1999), Loayza, Schmidt-Hebbel and Serven (2000) and Athukorala and Sen (2002), which consistently show that the Ricardian hypothesis does not hold strictly although some offsetting exists.

The rejection of this hypothesis may be partly due to the presence of an imperfect financial market in Malaysia, which invalidates one of the key assumptions in

the Ricardian equivalence proposition of Barro (1974). Specifically, an increase in public saving by one percentage point will result in a 0.125 percentage point decline in private saving and a 0.180 percentage point decline in voluntary private saving. The crowding out effect is found to be slightly larger in Model B that excludes EPF contributions in the analysis.

The coefficients on $D_{85\text{-}86}$ and $D_{97\text{-}98}$ are found to be statistically insignificant, implying that neither the world economic recession in 1985-86 nor the 1997-98 Asian financial crisis had an impact on saving. Therefore, they are dropped from the estimation.

With regard to short-run dynamics, the regression results for the conditional ECM of $\Delta \ln PRS_t$ and $\Delta \ln VPRS_t$ reported in panel B of Table 6.2 show that, except for the intercepts, all coefficients are statistically significant at the 10% level. In first-differenced form, all variables have the appropriate signs, consistent with the results obtained in the long-run models. The coefficient on $\Delta \ln PPI_t$ is not reported since it is found to be statistically insignificant, suggesting that income growth has no impact on the evolution of private saving behaviour in Malaysia.

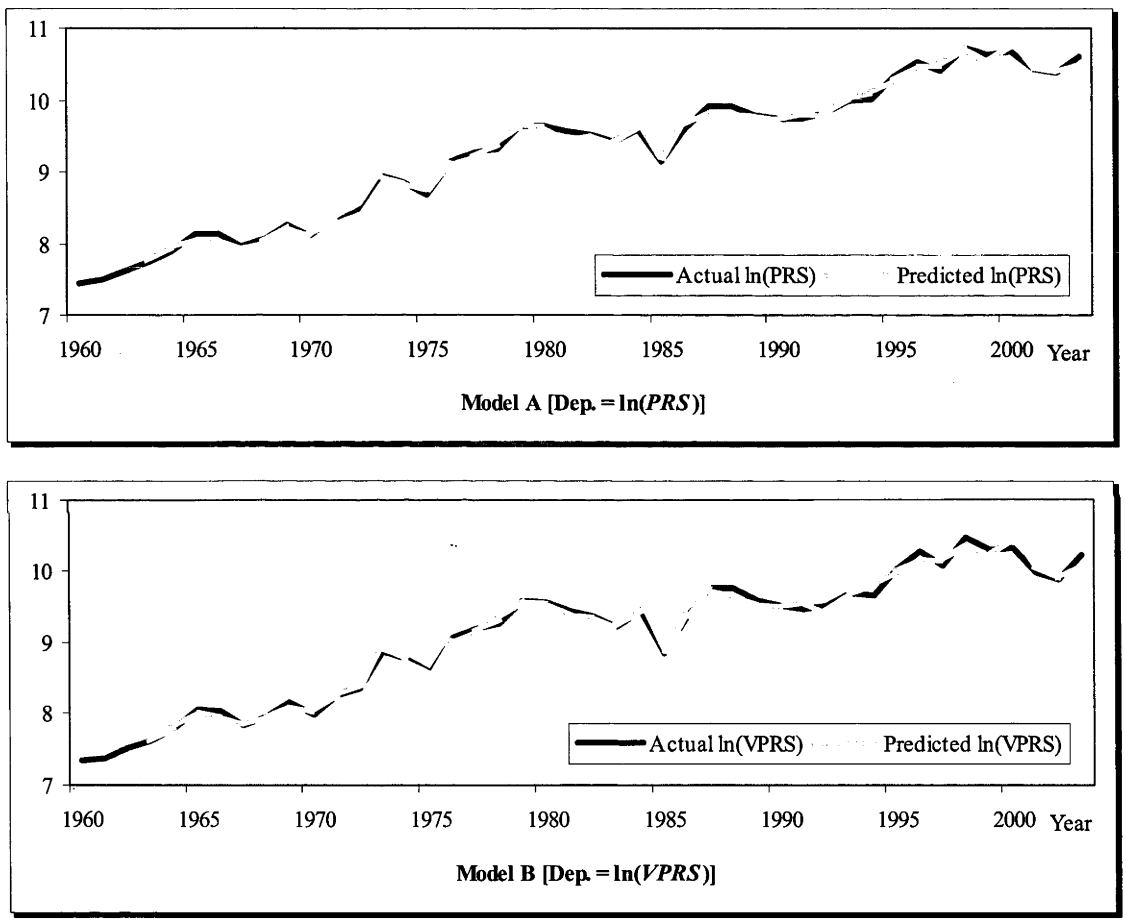
Interestingly, in contrast with the long-run results, the coefficients of YAG_t and OAG_t are found to be statistically significant and have the expected (negative) signs in the short-run models. This suggests that the private sector tends to save less in the short-run with the increase of dependent population relative to working population, which is consistent with the prediction of the LCM. The evidence also highlights that the proportion of elderly population relative to persons of working age has a much larger negative impact on the behaviour of saving in the private sector, compared to the proportion of young age population, supporting the argument of treating young and old age dependency as two separate demographic factors in the analysis. The results provide some support for the view that demographic factors are crucial in explaining the variations in private saving across time, as suggested by previous studies, including Edwards (1996), Horioka (1997), Masson, Bayoumi and Samiei (1998), Loayza, Schmidt-Hebbel and Serven (2000), Athukorala and Tsai (2003) and Modigliani and Cao (2004).

The coefficients on ECT_{t-1}, which measure the speed of adjustment back to the long-run equilibrium value, are statistically significant at the 1% level and have the right sign, i.e., negative, suggesting that an error correction mechanism exists. The speed of adjustment at 82.5 to 95 per cent a year is considered quite high. It takes less

than 1.5 years to achieve long-run equilibrium whenever there is a deviation from the long-run steady state.

Figure 6.3 shows the actual and predicted levels of private saving. Predicted $\ln PRS_t$ and $\ln VPRS_t$ are the long-run (static) equilibrium levels of real private saving and real voluntary private saving, respectively, which are constructed based on the observed variables in the unrestricted ECM. It is evident that the predicted series track the actual series very closely over time in each model.

Figure 6.3: Actual and predicted private saving series



6.5 Conclusion

This chapter examines the determinants of private saving in Malaysia. Drawing on the life cycle theory, the saving function is estimated by incorporating other relevant structural features of Malaysia into the specification. Particular emphasis has been placed on the effect of mandated retirement saving schemes on private saving behaviour, since EPF saving constitutes a large proportion of private saving in

Malaysia. The predictions of the life cycle hypothesis are supported by the finding of a positive impact from real income. A negative effect of the age dependency ratio on private saving is found in the short-run but not the long-run. From a policy point of view, the evidence suggests that an increase in financial deepening and real interest rates contribute positively to private saving. Compulsory saving, in the form of EPF, seems to exert a negative influence on private saving. Hence, pension saving appears to be a substitute for private saving. The Ricardian equivalence hypothesis does not seem to hold strictly in Malaysia, given that public saving only partially crowds out private saving.

CHAPTER 7: THE DETERMINANTS OF PRIVATE INVESTMENT

7.1 Introduction

This chapter examines the determinants of private investment, with an emphasis on the role of financial sectors. Given that capital formation in the private sector is the key engine for long term growth in Malaysia, the understanding of investment behaviour in the private sector provides an important insight into how development in the Malaysian financial system impacts on economic growth.

The analytical framework is derived from the neoclassical investment model, with appropriate modifications to account for the structural features observed in The Malaysian economy. The investment function is disaggregated into private and public investment, with the focus specifically on the former. Private investment comprises private domestic investment and FDI. As highlighted in Chapter 3, FDI constitutes a significant proportion of total investment in Malaysia. Since FDI depends on a set of determinants which is quite different from that of private domestic investment, a private domestic investment function (private investment excludes FDI) is estimated separately to avoid aggregation bias.

This chapter proceeds as follows. Section 7.2 derives the investment function from the neoclassical framework. This simple framework is inadequate to characterize the unique structural features of Malaysia, and therefore it is modified to provide an alternative specification of the investment equation. A cost minimization problem is adopted to introduce dynamics into the model by assuming that firms optimize their investment levels with respect to a quadratic loss function. The dynamic investment function is then estimated using an ECM. Data are described in section 7.3. The private investment and private domestic investment models are tested in section 7.4, and the results are presented and analysed. Finally, the last section summarizes the findings.

7.2 A Model of Private Investment

In an empirical study of this nature, there is always a trade-off between estimating a specification derived directly from theoretical investment optimization models, and an *atheoretical* reduced-formed specification obtained by incorporating many investment determinants. In view of this, an approach is taken to strike a balance between these two considerations. The empirical specification is first derived using the neoclassical model, which is the most commonly used specification for investment

analysis (Blejer and Khan, 1984; Chirinko, 1993). This basic model is then modified accordingly to take into account both the new developments in the literature and the structural features observed in the Malaysian economy.[57] This involves the consideration of income level, user cost of capital, bank credit, macroeconomic uncertainty and public investment as the relevant determinants of private investment. By doing so, the specification encompasses a sound theoretical underpinning on the determinants of investment while taking into account the unique structural features of Malaysia.

7.2.1 Neoclassical model

The neoclassical model of investment, pioneered by Jorgenson (1963, 1967, 1971), postulates that output levels and user cost of capital are the two key determinants of investment. Consider a firm which produces an output (Q_t) by using only capital (K_t) and labour (L_t). The firm's objective is to maximize its market value (V_t):

$$\max \quad V_t = \int_0^{\infty} e^{-R_t} \left[p_t Q_t - w_t L_t - q_t I_t^N \right] dt \tag{1}$$

where R_t is the discount rate, and I_t is the net purchase of capital at time *t*. The product Q_t is sold at p_t and the inputs are bought at w_t and q_t. The firm has to choose K_t, L_t, and I_t to maximize its net present value, which depends on the future stream of profits generated by the firm. Assuming certainty, Nickell (1978) shows that Eq. (1) can be reduced to a one-period static profit maximization problem:

$$\text{Max} \quad \Pi_t = p_t Q_t - w_t L_t - C_t K_t \tag{2}$$

where C_t is the user cost of capital. Suppose the technology adopted to produce the output can be represented by a simple Cobb-Douglas production function:

$$Q_t = A K_t^{\lambda} L_t^{\gamma} \tag{3}$$

Under the assumption of a perfectively competitive market, profit maximization requires:

$$\begin{aligned} &\frac{\partial \Pi_t}{\partial K_t} = \lambda p_t A K_t^{\lambda-1} L_t^{\gamma} - C_t = 0 \\ &\Rightarrow C_t = \lambda \frac{p_t Q_t}{K_t} = \lambda \frac{Y_t}{K_t} \end{aligned} \tag{4}$$

[57] This is not a novel approach. Several key studies on investment analysis have also adopted this approach. See Sundararajan and Thakur (1980), Tun Wai and Wong (1982), Blejer and Khan (1984) and Athukorala and Sen (2002).

where λ is the share of capital in output and Y_t is nominal output (the product of p_t and Q_t). Hence, the optimal level of capital stock (K_t^*) is given as:

$$K_t^* = \lambda \frac{Y_t}{C_t}. \tag{5}$$

Net investment (I_t^N) can be represented by a distributed lag on the past changes in desired capital stock:

$$I_t^N = \sum_{j=0}^{n} b_j(\Delta K_{t-j}^*) = \lambda \sum_{j=0}^{n} b_j \Delta(Y_{t-j} / C_{t-j}). \tag{6}$$

Assuming that replacement investment (I_t^R) is linearly related to capital stock lagged by one period:

$$I_t^R = dK_{t-1}, \tag{7}$$

where d is the rate of depreciation of capital stock, which is usually assumed to be constant. Hence, the gross investment function is:

$$I_t = I_t^N + I_t^R = \lambda \sum_{j=0}^{n} b_j \Delta(Y_{t-j} / C_{t-j}) + dK_{t-1}. \tag{8}$$

7.2.2 Modified neoclassical model

This basic neoclassical investment framework is modified drawing upon Bischoff (1967, 1970, 1971). Bischoff's modification of the model is based on the observation that most changes in the capital-output ratio (or the relative prices of input) depend on *new* equipment and structures, rather than on existing capital stocks. Hence, the changes in relative prices of input should be different from changes in output. Accordingly, demand for investment should depend on the *levels* of output, instead of the *changes* of output as predicted by the standard neoclassical model:

$$I_t = \lambda \sum_{j=0}^{n} b_j (Y_{t-j} / C_{t-j}) + dK_{t-1}. \tag{9}$$

Adopting the strict version of Jorgenson's neoclassical model may pose some problems. For example, it is unlikely the expression of $K_t^* = \lambda Y_t / C_t$ will hold strictly as the demand function for desired level of capital stock. Similarly, not all entities share the ultimate objective of maximizing market values or profits. For example, educational institutions, welfare organizations, and religious bodies do not belong to this category (Bischoff, 1970). For these reasons, a simple linear specification is preferred:

$$K_t^* = f(Y_t, C_t). \tag{10}$$

Given the perpetual inventory model $I_t = K_t - (1-\delta)K_{t-1}$, steady state equilibrium condition gives $K_t^* = K_t = K_{t-1}$. Hence, $I_t^* = \delta K_t^*$ so that Eq. (10) also determines equilibrium investment:

$$I_t^* = f(Y_t, C_t). \tag{11}$$

where I_t^* is the steady state of investment. Such a linear specification is consistent with the empirical strategy adopted by the modern empirical literature on investment demand functions.[58] Next, the specification for investment in Eq. (10) is modified to account for the institutional and structural features of a developing country.

(a) Bank credit

The neoclassical model of investment is based upon the restrictive assumption that financial markets are frictionless and there is unlimited supply of credit. However, developing countries are often characterized by credit constraints due to market imperfections such as problems of asymmetric and contract enforcement (Ganesh-Kumar, Sen and Vaidya, 2003). Imperfections in credit markets may prevent firms from borrowing as much as they would wish. Such a constraint will in general discourage the undertaking of investment projects. The McKinnon-Shaw thesis of financial liberalization postulates a complementary relationship between the accumulation of financial assets and physical capital. In this connection, the removal of financial constraints may mitigate the liquidity constraints faced by entrepreneurs, and significantly increase the amount of funds available for investment. Furthermore, development of financial systems can help overcome these market frictions by exploiting economies of scale in the evaluation and monitoring of borrowers, and thus facilitating the flow of funds between savers and investors. This largely ameliorates credit constraints faced by firms lacking an easy access to bank credit (Cornelli, Portes and Schaffer, 1996).

(b) Macroeconomic uncertainty

Investment may be adversely affected by economic uncertainty (Villanueva and Mirakhor, 1990). Macroeconomic uncertainty in this study refers to a situation when there are severe fluctuations in output levels, which induce greater variance in returns on investment projects. If investments are irreversible, firms are more prone to delay or

[58] See, e.g., Guncavdi, Bleaney and McKay (1998) and Athukorala and Sen (2002).

abandon investment projects in an uncertain economic environment.[59] Postponing investment until the future becomes more certain may generate opportunity costs whereas forgoing an investment project results in a loss of initial outlays. Furthermore, in an uncertain economic environment, firms will be encouraged to maintain a highly liquid asset position. Productive activities requiring commitments in long-term fixed investments will be discouraged. As such, less capital accumulation will occur in a highly uncertain economic environment. In this way, a negative link between investment and macroeconomic uncertainty is established.

(c) Public investment

It is a widely accepted view that public investment may be complementary to, rather than competing with, private investment in developing countries. Public investment may facilitate and stimulate private investment through the provision of infrastructural support (Sundararajan and Thakur, 1980; Blejer and Khan, 1984; Greene and Villanueva, 1991). This can raise the productivity of capital, and expand the overall resource availability by increasing output. On the other hand, public investment may also crowd out private investment. This occurs when additional public investment requires raising future tax and domestic interest rates, or if the public sector produces investment goods that directly compete with private goods. In addition, the utilization of additional physical and financial resources, which would otherwise be available to the private sector, may also depress private investment (Blejer and Khan 1984; Aschauer 1989a).

7.2.3 FDI flows and domestic investment

FDI can have both positive and negative effects on private domestic investment. It can stimulate domestic investment by providing new investment opportunities for local firms through the provision of machinery and technology which can not otherwise be produced domestically (Sun, 1998). Local firms can emulate the new technology introduced by foreign firms, which may stimulate domestic investment (Noorzoy, 1979). Besides, an increase in domestic investment is likely to be accompanied by an increase in FDI inflows when there are more joint venture activities between local firms and foreign firms (Jansen, 1995). FDI may also contribute to higher domestic investment through introducing new export industries to the host country. These new

[59] Irreversible investment expenditures are sunk costs which cannot be recovered or used in a different activity. For more discussion, see Hartman (1972), Pindyck (1991) and Dixit and Pindyck (1994).

industries are integrated into worldwide networks of production, enabling them to grow rapidly (Lipsey, 2004). In this way, FDI and private domestic investment are complementary to each other.

On the other hand, FDI may crowd out domestic investment if foreign firms compete with local firms for the use of domestic scarce resources, such as skilled labour, financial resources, etc. (Jansen, 1995). FDI may also disrupt backward linkages in domestic manufacturing through the substitution of imports for domestic goods. Furthermore, FDI may substitute for domestic investment if foreign firms have an edge in technological or managerial expertise, or tax benefits provided by the host country (Noorzoy, 1979). These new technologies embodied in FDI may accelerate technological obsolescence of traditional technologies used in developing countries and therefore crowd out domestic investment (Kim and Seo, 2003; Lipsey, 2004).

The above discussion suggests that the effects of FDI on private domestic investment may vary from country to country, depending on the types of FDI, the trade policies adopted in the host country, and the strengths of the domestic firms. Therefore, the impact of FDI inflows on private domestic investment is ultimately an empirical matter.

7.2.4 Model specification

Renaming the variables as $Y_t = GDP_t$ and $C_t = COC_t$, and augmenting Eq. (11) with the above theoretical considerations leads to formulation of the following empirical specifications of the long-run private investment and private domestic investment equations:

$$\text{Model A}: \bar{I}_t^* = f_A(GDP_t, COC_t, BC_t, UNC_t, PUB_t, D_{69}, D_{85-86}, D_{97-98}) \quad (12a)$$

$$\text{Model B}: \tilde{I}_t^* = f_B(GDP_t, COC_t, BC_t, UNC_t, PUB_t, D_{69}, D_{85-86}, D_{97-98}) \quad (12b)$$

$$\text{Model C}: \tilde{I}_t^* = f_C(GDP_t, COC_t, BC_t, UNC_t, PUB_t, FDI_t, D_{69}, D_{85-86}, D_{97-98}) \quad (12c)$$

where $\bar{I}_t^*$ is the steady-state real private investment (PRI_t) and $\tilde{I}_t^*$ is the steady state real private domestic investment (PDI_t). Although the main objective is to estimate a private domestic investment function, a private investment function is also estimated in Model A to allow for comparison of the results with other studies, which have largely focused on analysing the behaviour of private investment. The same set of regressors is used in both Model B and Model C except that FDI is included as an additional variable in the latter. The specification in Model C allows examination of whether FDI crowds in or

crowds out private domestic investment in Malaysia. The independent variables, with the expected signs in the parentheses, are defined as follows:

GDP_t = real output (+)

COC_t = real user cost of capital (–)

BC_t = real bank credit flow to the private sector (+)

UNC_t = macroeconomic uncertainty (–)

PUB_t = real public investment (?)

FDI_t = real foreign direct investment (?)

PRI_t, PDI_t, GDP_t, PUB_t and FDI_t are converted into natural logarithms. The above specification includes three dummy variables to account for the racial riots in 1969, the global economic recession that hit Malaysia in 1985-86, and the 1997-98 Asian financial crisis, defined as:

$$D_{69} = \begin{cases} 1 \text{ if } t = 1969 \\ 0 \text{ otherwise} \end{cases}; \quad D_{85-86} = \begin{cases} 1 \text{ if } t = 1985-86 \\ 0 \text{ otherwise} \end{cases} \text{ and } D_{97-98} = \begin{cases} 1 \text{ if } t = 1997-98 \\ 0 \text{ otherwise} \end{cases}$$

7.2.5 Dynamic specification

Having established the steady-static (long-run) specification of the investment function, dynamics are now introduced. To derive a dynamic investment model suitable for econometric estimation, Sims' (1974) approach is followed by postulating a dynamic cost optimization problem that imposes costs on "mistakes" made by agents. Suppose that every year, each firm in the economy has a desired level of investment I_t^*. This ideal level of investment depends on a number of factors stated in Eq. (12a, b, c). The actual level of investment (I_t) differs from that of the desired level (I_t^*) due to the costs associated with adjusting I_t. To illustrate how this would lead to a dynamic investment model, consider that in any period t, the representative firm's objective is to minimize the following penalty function by optimizing the level of investment:[60]

$$\underset{I_t}{\text{Min}} \; E_t \left\{ \sum_{t=1}^{\infty} \delta^t \left[a(I_t - I_t^*)^2 + b(I_t - I_{t-1})^2 - 2c(I_t - I_{t-1})(I_t^* - I_{t-1}^*) \right] \mid \Omega_t \right\} \qquad (13)$$

[60] It would be more appropriate to formulate the dynamic optimization problem in a continuous time manner. However, a discrete time model has been used for simplicity. Nevertheless, this simplification does not affect the qualitative aspects of the analysis.

where δ^t is the discount factor which takes a value between 0 and 1, and Ω_t is the firm's information set at time t. The first term in the square bracket represents the cost of deviation from the desired level of investment. The second term is the cost of rapidly changing the level of investment. The last term is included due to Hendry and von Ungern-Sternberg (1981), who argue that the penalty is reduced if firms move in the correct direction, i.e., towards the equilibrium level of investment. The last term will converge to zero if the desired level of investment remains unchanged.

The firm seeks to minimize the expectation of the future stream of costs associated with investment decision makings, conditional upon all available information Ω_t at time t. Since it is difficult to estimate the discount factor, the approach of Callen, Hall and Henry (1990) is taken by setting it to unity for simplicity. This does not affect the general form of the solution to the model. Invoking the certainty equivalence theorem and the rational expectation hypothesis so that expectation is replaced by future realization, and choosing I_t at time t to minimize expected costs leads to the following Euler condition:

$$(a+2b)I_t - b(I_{t-1}+I_{t+1}) = (a+2c)I_t^* - c(I_{t-1}^*+I_{t+1}^*) \tag{14}$$

Next,

$$\text{Let } x_t = I_t - \frac{c}{b}I_t^* \tag{15}$$

Eq. (14) can be written as:

$$\left[(a+2b) - bL - bL^{-1}\right]x_t = \frac{a(b-c)}{b}I_t^* \tag{16}$$

$$\text{or } A(L)x_t = \frac{a(b-c)}{b}I_t^* \tag{17}$$

A solution for Eq. (17) may be defined as:

$$A(L) = \lambda(1-\theta L)(1-\phi\theta L^{-1}) \tag{18}$$

and so Eq. (17) may be written as:

$$\lambda(1-\theta L)(1-\phi\theta L^{-1})x_t = \frac{a(b-c)}{b}I_t^*$$

$$\Rightarrow x_t = \theta x_{t-1} + \frac{a(b-c)}{\lambda b}\sum_{i=0}^{\infty}(\theta\phi)^i I_{t+i}^*. \tag{19}$$

Using Eq. (15) and some manipulation obtain:

$$\Delta I_t = (\theta-1)I_{t-1} + \frac{c}{b}\Delta I_t^* + \frac{c(1-\beta)}{b}I_{t-1}^* + \frac{a(b-c)}{\lambda b}\sum_{i=0}^{\infty}(\theta\phi)^i I_{t+i}^*. \tag{20}$$

Nickell (1985) shows that the use of a standard ECM is consistent with the optimizing behaviour of economic agents. The simplest case demonstrated by Nickell is followed by assuming I^*_{t+i} follows a random walk with drift:

$$I^*_{t+i} = I^*_t + gi \tag{21}$$

where g is the drift term. Then substituting Eq. (21) into Eq. (20), and rearranging the terms gives the familiar error correction representation of the dynamic investment demand model:

$$\Delta I_t = a_0 + a_1 \Delta I^*_t - a_2 (I_{t-1} - I^*_{t-1}) \tag{22}$$

The error-correction term $(I_{t-1} - I^*_{t-1})$ captures the long-run equilibrium relationship between variables whereas the differenced terms (ΔI^*_t) capture the short-run dynamics. The use of an ECM is appropriate in this context since investment decisions are likely to be gradual and subject to revision in a developing country. Although equilibrium investment I^*_t is unobservable, Eq. (22) can be estimated by using the long-run steady state investment functions in Eq. (12a, b, c).

7.3 Data

Figure 7.1 displays the evolution of the key variables used in this analysis over the period 1960-2003. These variables are presented in their original forms without taking logarithmic transformation. It is clear all investment series, i.e., PRI_t , PDI_t and PUB_t, have increased rapidly during the period 1987-1997. After the crisis, PUB_t has continued to increase due to the on-going government primp-priming activities, whereas PRI_t and PDI_t have declined dramatically due to the catastrophic effect of the crisis. The difference between PRI_t and PDI_t reflects the inflows of FDI.[61]

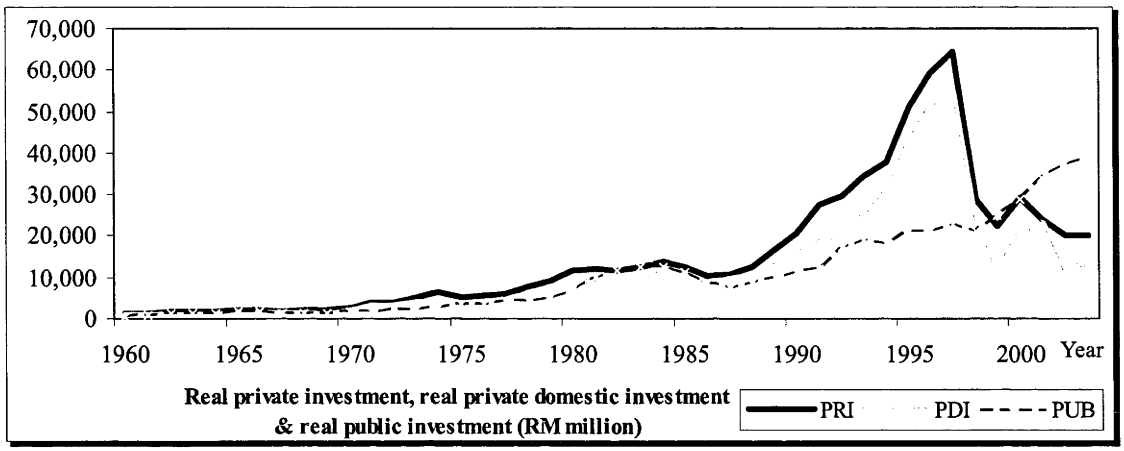
FDI_t has generally been on the rising trend up to the early 1980. It increased rapidly from the late 1980s to early 1990s. Since then, it has been subject to some fluctuations. The series declined sharply in 1998 and 2001, which may be due to the Asian financial crisis and the world trade recession, respectively.

COC_t shows considerable variation over the period. 1985-86 saw a surge in the series as a result of a drop in GDP price levels following the global economic recession. COC_t declines sharply after 1986 following the enactment of the Promotion of Investment Act 1986.

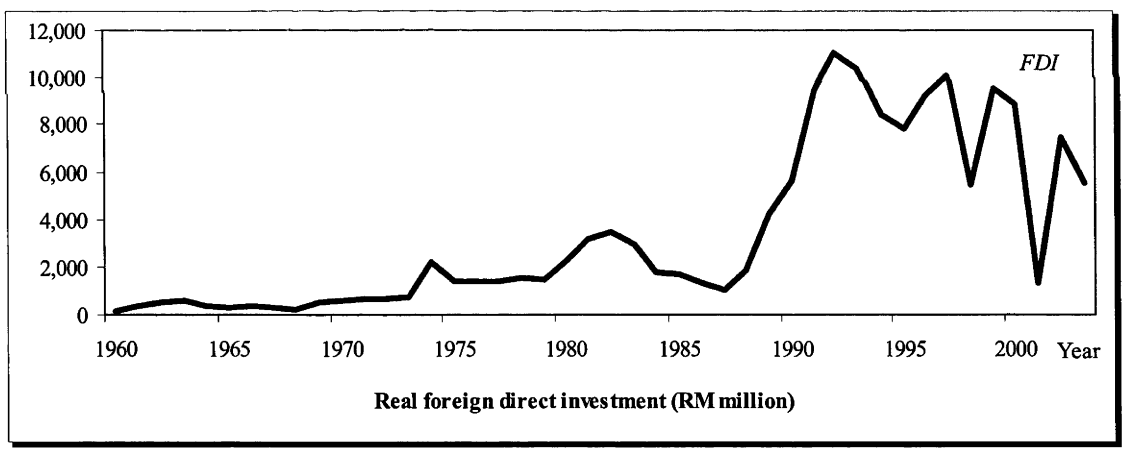
[61] See Chapter 3 for more discussion on the pattern and behaviour of private investment.

$\Delta lnBC_t$ experiences some fluctuations over time. The series has been quite stable prior to the 1980s. However, the series has tended to fluctuate a great deal in the 1980s, reflecting a high volatility in the financial system during this period. The series has also declined dramatically during the Asian financial crisis period before reversing in 2000.

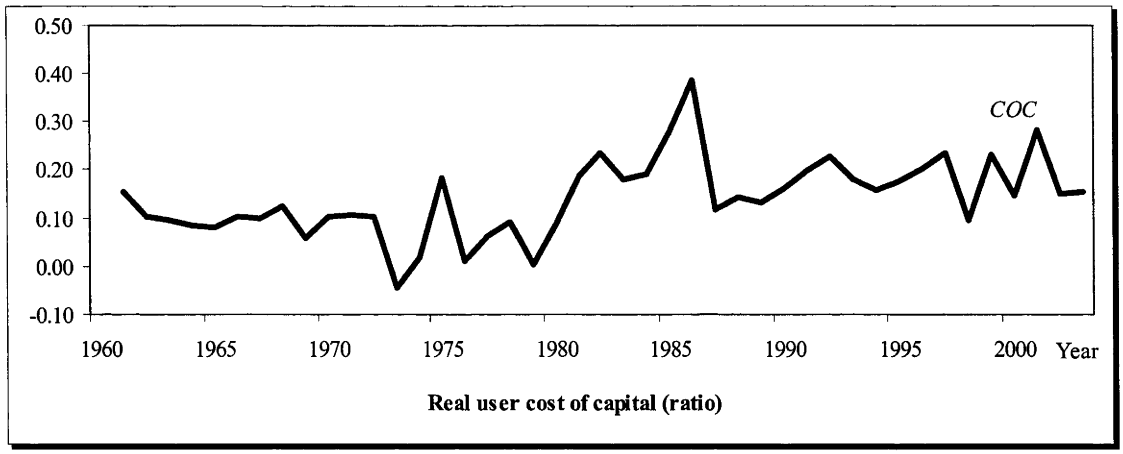
Figure 7.1: Time series plots of key variables



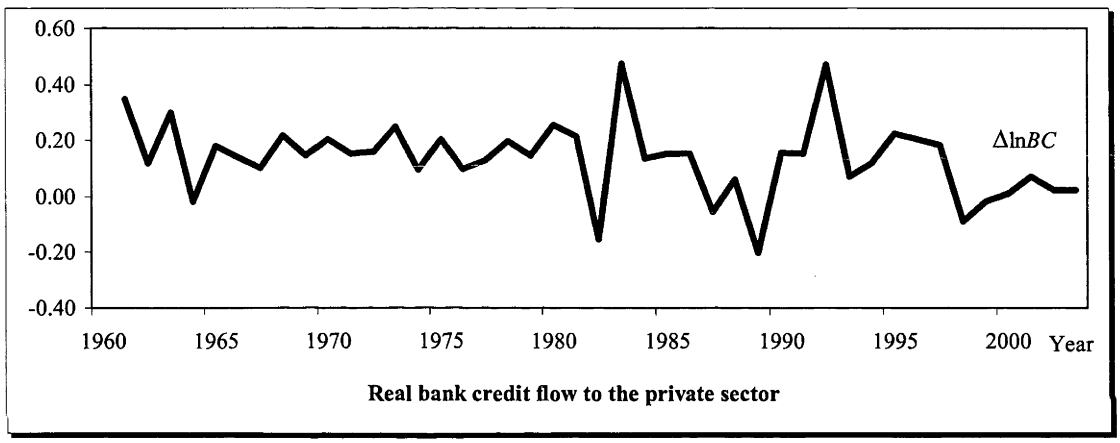
Notes: PRI = gross fixed private capital formation/gross capital formation deflator; PDI = (gross fixed private capital formation - foreign direct investment)/gross capital formation deflator; PUB = gross fixed private capital formation/gross capital formation deflator.



Notes: FDI = foreign direct investment/gross capital formation deflator.



Notes: COC = PK[(i - π - δ) / (1 - τ), where PK is the price of a unit of capital input, i is the financing cost of capital good, π is the inflation rate, δ is the rate of depreciation, and τ is the rate of corporate income taxes.



Notes: BC = first difference of logarithmic (bank credit to the private sector/GDP deflator).

7.4 Results

7.4.1 ARDL cointegration test

To perform the ARDL bounds test, the conditional ECM is estimated with one and two lags for each model. The results summarized in Table 7.1 indicate that the null hypothesis that there exists no level private investment equation is rejected at the 1% significance level for all models when two lags are chosen. Some weak evidence is found to support the existence of a long-run relationship when one lag is chosen for Model B. In line with the results of the bounds test, both AIC and SBC prefer a richer dynamic specification of two lags.

Table 7.1: ARDL bounds tests and lag length selection

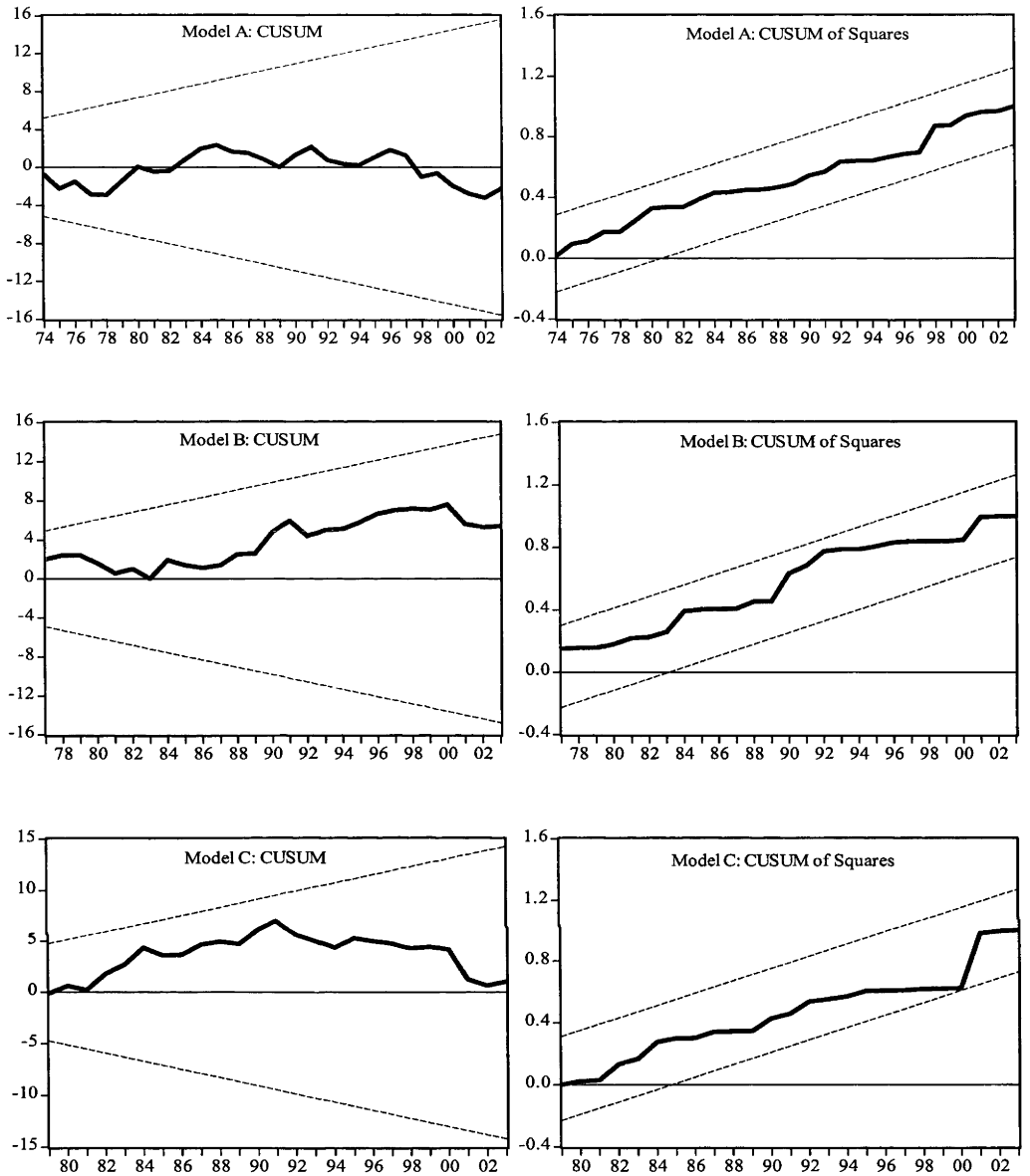
	Model A (Dep. = $\Delta \ln PRI_t$)		Model B (Dep. = $\Delta \ln PDI_t$)		Model C (Dep. = $\Delta \ln PDI_t$)	
	$p=1$	$p=2$	$p=1$	$p=2$	$p=1$	$p=2$
	ARDL bounds tests					
F-statistic	1.930	4.804***	3.453*	6.805***	1.923	8.933***
t-statistic	-3.036	-4.998***	-4.105*	-4.788***	-3.352	-5.992***
	Lag length selection criteria					
AIC	-1.131	-1.937	-0.649	-1.343	-0.637	-2.078
SBC	-0.258	-0.671	0.228	-0.203	0.366	-0.769

*Notes: p is the optimal lag length for the conditional ECM. $AIC = -2(ll/T) + 2(k/T)$ and $SBC = -2(ll/T) + (k/T)(\ln T)$, where ll is the maximized log-likelihood value of the model at lag p, k is the number of estimated coefficients, and T is the sample size. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (2001), and the null hypothesis is that there is no long-run relationship.*

7.4.2 Diagnostic checks

All the regression specifications fit remarkably well, satisfying normality, no serial correlation, absence of autoregressive conditional heteroskedasticity and homoskedastic residuals (see Table 7.2). However, Model A fails the regression specification error test (or Ramsey's RESET test). This is probably due to the presence of some non-linear effects in the adjustment process of private investment in which the linear specification adopted here is unable to take into account. The CUSUM and CUSUM of squares tests on the recursive residuals displayed in Figure 7.2 suggest no structural instability in the residuals of the private investment equations.

Figure 7.2: Plots of CUSUM and CUSUM of squares recursive residuals



7.4.3 The long-run relationship and short-run dynamics

Based on the results reported in Table 7.1, the estimation begins with two lags and systematically drops the insignificant terms. The estimated long-run and short-run results of the private investment equations are summarized in Table 7.2. All variables except COC_t enter the long-run equations with the predicted signs, and the coefficients are quite significant (see Table 7.2, panel A).

Table 7.2: Long-run and short-run results of the private investment equations

	A. The long-run equilibrium level relationship					
	Model A (Dep. = $\ln PRI_t$)		Model B (Dep. = $\ln PDI_t$)		Model C (Dep. = $\ln PDI_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	-13.640***	0.000	-12.662***	0.000	-10.115***	0.000
$\ln GDP_t$	2.284***	0.000	2.063***	0.000	1.837***	0.000
COC_t	0.862	0.242	0.354	0.339	0.301	0.373
BC_t	2.128***	0.004	2.355***	0.000	1.973***	0.000
UNC_t	-0.035***	0.003	-0.037***	0.000	-0.025***	0.000
$\ln PUB_t$	-0.388*	0.088	-0.210*	0.073	-0.204**	0.045
$\ln FDI_t$					0.109**	0.046
D_{69}	-0.535**	0.049	-0.667***	0.000	-0.533***	0.000
	B. The short-run dynamic model					
	Model A (Dep. = $\Delta\ln PRI_t$)		Model B (Dep. = $\Delta\ln PDI_t$)		Model C (Dep. = $\Delta\ln PDI_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	0.022	0.766	0.014	0.818	-0.111**	0.029
ECT_{t-1}	-0.429***	0.000	-0.759***	0.000	- 0.800***	0.000
$\Delta\ln GDP_t$	4.478***	0.000	3.636***	0.000	4.226***	0.000
ΔBC_t	0.236**	0.039	0.236***	0.033	0.202*	0.053
ΔUNC_t	-0.015***	0.008	-0.033***	0.000	-0.030***	0.000
$\Delta\ln PUB_t$					-0.320**	0.012
$\Delta\ln PDI_{t-1}$			0.287***	0.001	0.374***	0.000
$\Delta\ln GDP_{t-1}$	2.511***	0.000	4.839***	0.000	3.873***	0.000
ΔCOC_{t-1}			0.879**	0.000	0.567**	0.013
ΔBC_{t-1}	-0.499***	0.006	-1.224***	0.000	-1.134***	0.000
ΔUNC_{t-1}			0.024***	0.001	0.010*	0.100
$\Delta\ln PUB_{t-1}$			-0.379***	0.007	-0.248*	0.086
ΔCOC_{t-2}	-0.498**	0.011				
ΔBC_{t-2}	-0.259**	0.035	-0.789***	0.000	-0.673***	0.000
$\Delta\ln PUB_{t-2}$					-0.226**	0.045
Diagnostic checks	Test-statistic	*p*-value	Test-statistic	*p*-value	Test-statistic	*p*-value
$\chi^2_{NORMAL}(2)$	1.076	0.584	0.683	0.710	0.133	0.936
$\chi^2_{SERIAL}(1)$	1.205	0.272	0.061	0.805	1.221	0.269
$\chi^2_{SERIAL}(2)$	4.415	0.109	0.438	0.803	1.901	0.387
$\chi^2_{ARCH}(1)$	0.169	0.681	0.216	0.642	1.649	0.199
χ^2_{WHITE}	11.382	0.836	20.322	0.622	24.018	0.629
$\chi^2_{RESET}(1)$	8.001***	0.005	0.002	0.962	1.546	0.214

*Notes: The regressions for the long-run model are based on an unrestricted ECM, and corrected for both omitted lagged variable bias and endogeneity bias. The regressions for the short-run dynamic model are based on a conditional ECM. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.* $\chi^2_{NORMAL}(2)$ *refers to the Jarque-Bera statistic of the test for normal residuals,* $\chi^2_{SERIAL}(1)$ *and* $\chi^2_{SERIAL}(2)$ *are the Breusch-Godfrey LM test statistics for no first and second order serial correlation, respectively,* χ^2_{WHITE} *denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients,* $\chi^2_{ARCH}(1)$ *is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and* $\chi^2_{RESET}(1)$ *is the Ramsey's test statistic for no functional misspecification.*

On the whole, the findings are consistent with the theoretical predictions of a neoclassical model that private investment varies positively with output. A one per cent increase in output will result in a 1.837 to 2.284 per cent increase in private investment. The finding that $\ln GDP_t$ is an important determinant of private investment is consistent with the empirical evidence of Blejer and Khan (1984) and Greene and Villanueva (1991). However, COC_t is found to be statistically insignificant and has the wrong (positive) sign. Hence, there is no evidence to suggest that user cost of capital is an important variable in explaining private investment behaviour in Malaysia.[62]

In countries with directed credit programs and rationing financial systems, the quantity rather than the cost of financing is more likely to be the main determinant of investment (see Chibber and Shafik, 1992; Schmidt-Hebbel and Muller, 1992; Agrawal, 2004). In Malaysia, bank credit is found to have a strong positive and statistically significant impact on private investment, with a long-run elasticity in the range of 1.973 to 2.355. This implies that the shortage of credit during the crisis period dampened private capital formation.[63] The size of the coefficient is found to be largest in Model B which does not consider FDI. The results are not surprising given that foreign investors are likely to bring in their own financial resources whereas domestic investors are more likely to obtain funding in the domestic financial sector. The finding of a significant positive impact of bank credit on investment corroborates the empirical evidence of Yaakop (1988), Shafik (1992), Voridis (1993), Guncavdi, Bleaney and McKay (1998), Ndikumana (2000) and Ganesh-Kumar, Sen and Vaidya (2001, 2002, 2003).

Consistent with the argument of Villanueva and Mirakhor (1990), an increase in macroeconomic uncertainty exerts a negative effect on private investment. The long-run elasticity derived from the coefficient on UNC_t suggests a one per cent increase in macroeconomic uncertainty yields a 0.025 to 0.037 per cent reduction in private investment. The results tend to support the empirical findings of Greene and Villanueva (1991) and Ozler and Rodrik (1992). The results seem to suggest that in order to

[62] Alternative measures of cost of capital such as relative price of capital and real interest rates have also been considered in the estimation. However, they were also found to be insignificant in explaining the determination of private investment. Hence, the results are robust to the use of different measures of cost of capital.

[63] In the extreme case, a severe shortage of credit, dubbed "credit crunch", can retard growth in the non-tradable sector and result in slow economic recovery, as illustrated in the case of Mexico during the crisis period 1995-98 (see Krueger and Tornell, 1999). Using a disequilibrium analysis, Enya, Kohsaka and Pobre (2004) show that during the crisis period of 1997-1999, credit crunch appeared to exist in Malaysia and Thailand due to the sharp contraction in financial intermediating activities in these two economies.

provide a favourable investment climate for entrepreneurs, it is crucial for the government to maintain a sound political and economic environment. Macroeconomic policies designed to stabilize the economic environment could have the potential for boosting private investment especially in times of rapid output changes.

There is evidence that public investment crowds out private investment, although the crowding-out effect is less than one-to-one. This finding of a crowding-out effect from government investment is consistent with the cross-sectional evidence of Ozler and Rodrik (1992) which covers 32 developing countries. However, the results stand in sharp contrast to a large number of studies including Aschauer (1989) for the U.S., Greene and Villanueva (1991) for 23 developing countries, Shafik (1992) for Egypt, Odedokun (1997) for 48 developing countries, Laopodis (2001) for three newly industrialized countries, Athukorala and Sen (2002) for India, and Narayan (2004) for Fiji, which have consistently found public investment to play a complementary role in private capital formation.[64]

Public investment expenditure has been used in Malaysia as a key policy tool to stimulate economic growth, particularly after the Asian financial crisis. However, the evidence obtained in this study seems to suggest that public investment is not complementary to private investment. Instead, a rise in government investment is associated with a reduction in private sector investment. Hence, the ongoing pump-priming efforts made by the Malaysian government to revive total investment appear to be harmful for private investment. This is likely to be the case when additional government investment competes with private investment and results in a higher cost of financing. Similarly, more public investment may have led to an increase in anticipated future tax, thereby discouraging private investment.

The coefficient on $\ln FDI_t$ in Model C is statistically significant with a positive sign. A one per cent increase in FDI inflows will lead to a 0.109 per cent increase in private domestic investment. Even if a positive relationship between FDI and domestic investment can be established, the impact of FDI on a host country can be small if FDI inflows are a minor part of the country's capital formation (Lipsey, 2000). In Malaysia, the average share of FDI in total gross domestic capital formation was only 13 per cent per year over the period 1960-2003 (see Chapter 3). Hence, it is not surprising FDI exerts a small effect on private domestic investment.

[64] The sample has also been restricted to only the pre-crisis period, i.e., 1960-1996. However, the finding that public investment crowds out private investment remains unchanged although the magnitude of the crowding-out effect is smaller. This highlights that the crowding-out effect of public investment observed in Malaysia is not entirely driven by the post-crisis pump-priming effort made by the government.

The result that FDI has a complementary role to play in domestic capital formation is consistent with the findings of Van Loo (1977) and Noorzoy (1979) for the Canadian experience, Jansen (1995) for the Thai experience, Sun (1998) for the Chinese experience, Bosworth and Collins (1999) for 58 developing countries over the period 1978-95, and Agosin and Machado (2005) in panel regressions of five Asian countries (including Malaysia). The crowding in effect observed in Malaysia may imply that the domestic financial markets are not too tight. In cases where there are difficulties in raising funds in the domestic market, a crowding out effect is likely to be observed (Jansen, 1995).

Finally, the coefficient on D_{69} is found to be negative, implying that the racial riots of 1969 had a negative impact on private investment. The dummy variables which capture the effect of the global economic recession, i.e., $D_{85\text{-}86}$, and the Asian financial crisis, i.e., $D_{97\text{-}98}$, are found to be statistically insignificant and therefore excluded from the estimation.

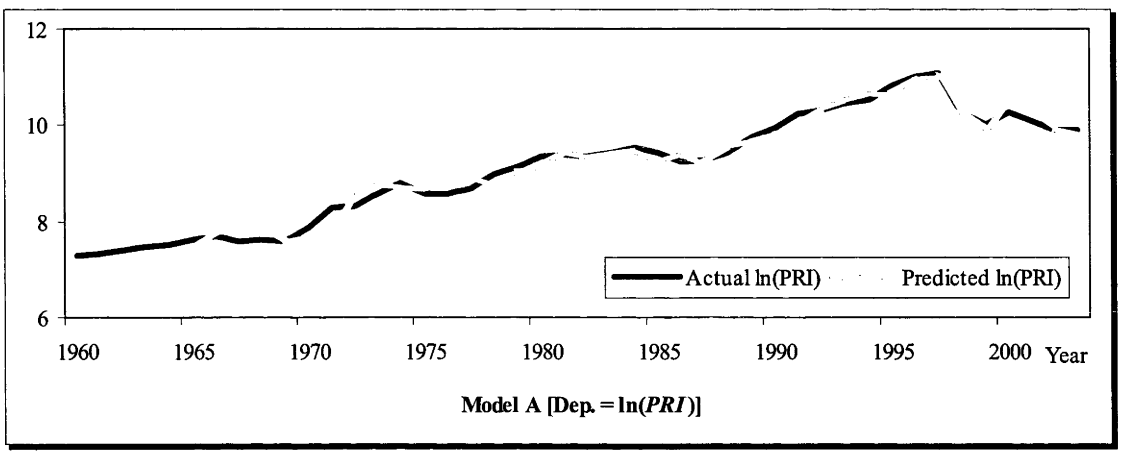
The results suggest that the sharp decline in private investment during the post-crisis period is largely attributable to the above-mentioned factors. To revive private investment, the government should consider adopting policies that boost economic development, easing credit constraints by developing a more efficient financial system, reducing macroeconomic uncertainties, restraining public investment expenditure, and encouraging FDI inflows. Among these, expanding the economy and improving the financial system seem to be the most effective mechanisms to boost private investment.

With regard to short-run dynamics, the regression results for the conditional ECM of $\Delta \ln PRI_t$ and $\Delta \ln PDI_t$, reported in panel B of Table 7.2, show several desirable features. Except for the intercept terms in Model A and Model B, all coefficients are statistically significant at the 10% level. In first-differenced form, all the variables have expected signs, consistent with the results reported in the long-run models.

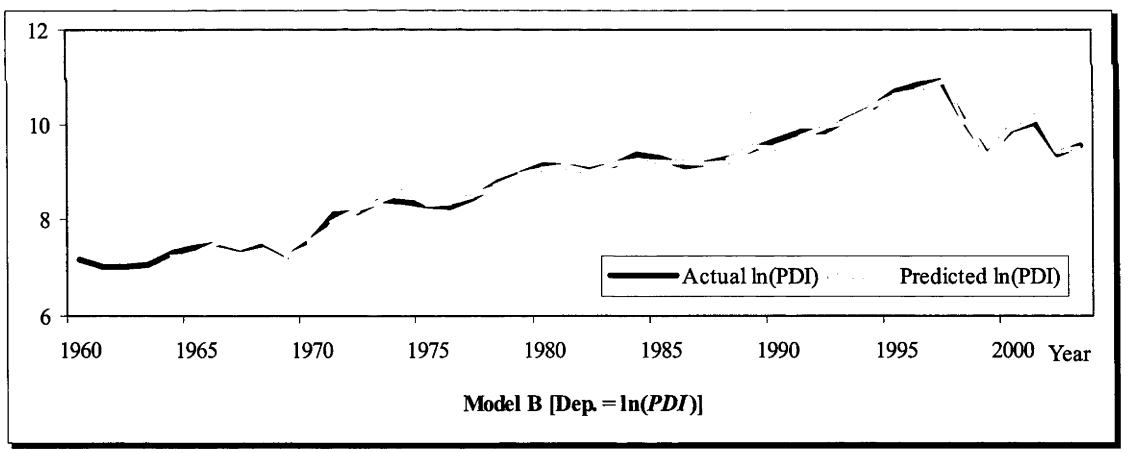
The coefficients on ECT_{t-1} are statistically significant at the 1% level and have the correct sign, providing further evidence for the use of an ECM framework. In Model A, private investment adjusts at the speed of 42.9 per cent every year, or it takes about 2.3 years, to restore equilibrium when there is a shock on the steady-state relationship. The speed of adjustment for Model B and Model C, ranging from 75.9 to 80 per cent a year, implies that it takes only about 1.2 to 1.3 years to achieve long-run equilibrium whenever there is a deviation from the long-run steady state. The results are not surprising given that there is little government control on private domestic investment.

Figure 7.3 shows the actual and predicted levels of private investment. Predicted $\ln PRI_t$ and $\ln PDI_t$ are the long-run (static) equilibrium levels of real private investment and real private domestic investment, respectively, which are constructed based on the observed variables in the unrestricted ECM. In all models, the predicted series track the actual series very closely over time for all models, providing additional evidence that all models are very well-fitted.

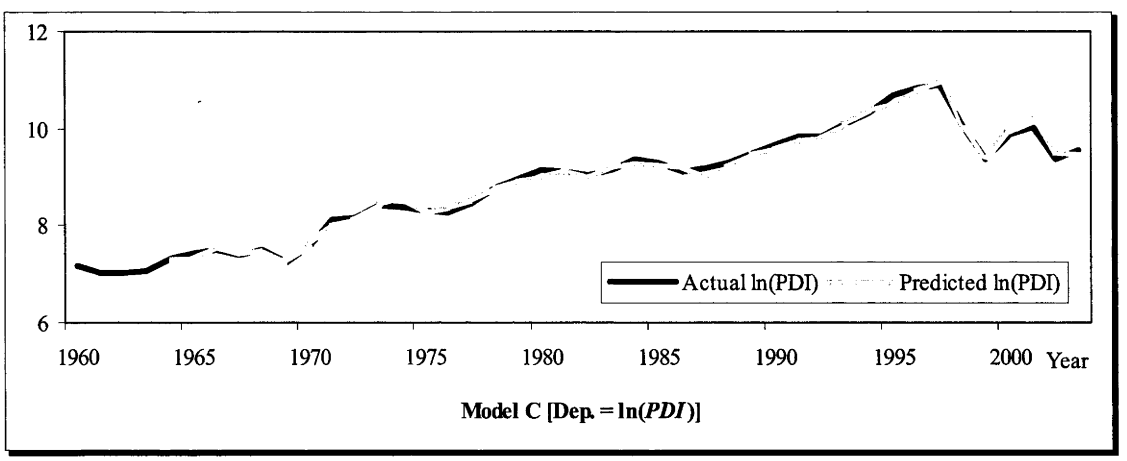
Figure 7.3: Actual and predicted private investment series



Model A [Dep. = ln(*PRI*)]



Model B [Dep. = ln(*PDI*)]



Model C [Dep. = ln(*PDI*)]

7.5 Conclusion

This chapter examines the determinants of real private investment in Malaysia in an autoregressive distributed lag (ARDL) framework, paying particular attention to the testing for a long-run cointegrating relationship between the variables under consideration. Most previous empirical studies have simply bypassed the theoretical considerations by adopting an encompassing approach, which incorporates a large number of potential determinants of private investment in the model specification. The analysis in this chapter makes use of a private investment model, drawing on the neoclassical framework while incorporating relevant institutional and structural features of Malaysia into the specification.

The estimated results suggest that the predictions of the neoclassical model are supported by the findings of a large positive impact of aggregate output on private investment. However, user cost of capital appears to be unimportant in private capital formation. Macroeconomic uncertainty exerts a negative influence on private investment. While there is also evidence that FDI crowds in private domestic investment, public investment partially crowds out private investment. More importantly, the evidence indicates that increased bank credit contributes positively to private investment, suggesting that financial development is crucial for the undertaking of investment projects in the private sector.

CHAPTER 8: THE SAVING AND INVESTMENT NEXUS[65]

8.1 Introduction

This chapter examines the relationship between the domestic saving and investment rates in Malaysia. Given that these two variables are cointegrated, the relationship is estimated using an ECM with a cointegrating framework to allow for an analysis on both the short-run and long-run dynamics of the saving-investment relationship.

The last two chapters have shown that financial factors affect both saving and investment decisions. The quantification of the link between saving and investment is crucial since higher capital accumulation necessitates more saving, which can be mobilized domestically or obtained from foreign countries. However, the link between domestic saving and investment may be significantly weakened by international capital mobility as saving accumulated in one country can be easily transferred to and invested in another country. Thus, it is important to examine the extent to which domestic saving has been used to facilitate the undertaking of investment projects. An important aspect of this relationship is the adoption of capital controls by the Malaysian government in the aftermath of the Asian financial crisis. This policy choice may have important implications in the dynamic relationship between saving and investment.

The chapter is organized as follows. Section 8.2 discusses the conceptual issues. In section 8.3, the empirical specification for the dynamic saving-investment relationship is derived based on an intertemporal current account model. Section 8.4 sets out the empirical model and describes the data. Section 8.5 presents and analyses the results. Policy implications of the results are briefly discussed. Finally, the last section concludes.

8.2 Conceptual Issues

In a seminal study, Feldstein and Horioka (1980) examine the extent of correlation between saving and investment across 16 OECD countries. They argue that there should be no relationship between a country's domestic saving and domestic investment in the presence of perfect capital mobility. Extra saving in any country will be channelled to the world capital market to fund other countries with favourable investment climates. Using cross-sectional analysis, they show that 85 to 95 per cent of

[65] A modified version of this chapter has been accepted for publication in Applied Economics. See Ang (2007b).

domestic savings are transformed into investment in the domestic economies. They find that the regression coefficient of saving on domestic investment is statistically different from zero but not different from one, suggesting that international capital mobility is rather low. This observed phenomenon is widely known as the "Feldstein-Horioka puzzle".

Following this controversial finding, the relationship between saving and investment has been the subject of intense research over the past two decades. The "Feldstein-Horioka puzzle" has been examined by a large number of authors, using both cross-country and time series data for individual countries. Many of these studies have confirmed the Feldstein-Horioka results of a high saving-investment correlation. Using a cross-sectional framework, the findings of Feldstein (1983), Penati and Dooley (1984), Dooley, Frankel and Mathieson (1987), Vos (1988) and Feldstein and Bacchetta (1989), among others, suggest a close relationship between domestic saving and investment rates. In line with these, time series studies in this strand of literature examine the dynamic saving-investment nexus over time and across different exchange rate and capital control regimes, and report similar findings (see Jansen and Schulze, 1996; Hussein, 1998; Taylor, 1998; De Vita and Abbott, 2002; Pelagidis and Mastroyiannis, 2003; Hoffmann, 2004; Narayan, 2005; Payne, 2005).

However, whether the results provide an indication of the degree of capital immobility remains debatable. Many economists disagree with the interpretation of the Feldstein-Horioka results due to one thing: the increased integration of the global financial markets observed today is inconsistent with the argument of declining capital mobility. Using alternative measures of capital mobility, such as purchasing power and interest rate differentials, the results of Sachs (1981), Obstfeld (1986), Frankel and MacArthur (1990) and Baxter and Crucini (1993), among others, show that the long-run capital mobility is increasing over time.

Based on these findings, a number of authors argue that the Feldstein-Horioka finding is simply due to various methodological problems, such as endogeneity problems (Dooley, Frankel and Mathieson, 1987), and failure to appropriately allow for differences in country size (Ho, 2003; Bahmani-Oskooee and Chakrabarti, 2005), financial structure (Kasuga, 2004), non-traded goods (Wong, 1990), productivity shocks (Obstfeld, 1986; Cardia, 1991), fiscal policy (Bayoumi, 1990), and intertemporal budget constraints (Coakley, Kulasi and Smith, 1996; Moreno, 1997). After accounting for these differences, the link between domestic saving and investment is found to be significantly weaker.

8.3 An Intertemporal Model of Current Account

In this chapter, the model developed by Sheffrin and Woo (1990) is used to derive a current account dynamic model based on intertemporal optimization. This model originates from the seminal work of Sachs (1981), and has been widely adopted in many studies of current account dynamics. The current account intertemporal model embodies an important econometric feature of the saving-investment relationship, i.e., these two variables are cointegrated. This cointegrating feature can be demonstrated using the approach of Campbell (1987) and Campbell and Shiller (1987).

To begin with, consider the international borrowing and lending model of Sachs (1981), which assumes a small open economy. Such an assumption is particularly pertinent to the case of Malaysia. The economy faces a given world interest rate (r) and the stock of foreign assets (F_t) evolves according to the following equation:

$$F_{t+1} = (1+r)F_t + (Y_t - C_t - I_t - G_t) \tag{1}$$

where Y_t refers to GDP, C_t denotes consumption, I_t is investment, and G_t is government spending. The solvency condition requires satisfying the no Ponzi scheme, with a full repayment of lending in infinity.[66]

$$\lim_{i\to\infty} \frac{F_{t+i}}{(1+r)^i} = 0 \tag{2}$$

Let $Z_t = Y_t - C_t - I_t - G_t$, assuming agents are forward looking, solving Eq. (1) iteratively yields:

$$\begin{aligned}
&F_{t+1} = (1+r)F_t + Z_t \\
&F_{t+2} = (1+r)F_{t+1} + Z_{t+1} = (1+r)^2 F_t + (1+r)Z_t + Z_{t+1} \\
&F_{t+3} = (1+r)F_{t+2} + Z_{t+2} = (1+r)^3 F_t + (1+r)^2 Z_t + (1+r)Z_{t+1} + Z_{t+2} \\
&\quad\vdots \\
&F_{t+i} = (1+r)F_{t+i-1} + Z_{t+i-1} = (1+r)^i F_t + (1+r)^{i-1} Z_t + (1+r)^{i-2} Z_{t+1} + \cdots + Z_{t+i-1} \\
&\Rightarrow \frac{F_{t+i}}{(1+r)^i} = F_t + \sum_{i=1}^{i} \frac{Z_{t+i-1}}{(1+r)^i}
\end{aligned}$$

When $i \to \infty$, applying the no Ponzi condition in Eq. (2) yields:

$$F_t = -\sum_{i=1}^{\infty} \left[\frac{Y_{t+i-1} - C_{t+i-1} - I_{t+i-1} - G_{t+i-1}}{(1+r)^i} \right] \tag{3}$$

Eq. (3) can be re-arranged as:

---

[66] The no Ponzi game condition rules out the possibility for the government to issue bonds and roll it over forever. By imposing such a scheme, the present value of the government's purchases cannot exceed the present value of revenues.

$$\sum_{i=1}^{\infty}\frac{C_{t+i-1}}{(1+r)^{i}}=F_{t}+\sum_{i=1}^{\infty}\frac{(Y_{t+i-1}-I_{t+i-1}-G_{t+i-1})}{(1+r)^{i}} \tag{4}$$

Eq. (4) states that the discounted future stream of consumption is equal to claims on foreign assets plus the discounted future stream of output, net of investment expenditure and government expenditure.

The economy is assumed to be populated by an infinitely-lived representative agent, who maximizes an intertemporal utility function of the form:

$$\sum_{i=0}^{\infty}(1+r)^{-i}E_{t}[u(C_{t})] \tag{5}$$

Assuming that the utility function follows a quadratic form, and maximizing Eq. (5) subject to the constraint in Eq. (4) leads to:

$$C_{t}=r\left[F_{t}+\left(\frac{1}{1+r}\right)\sum_{i=0}^{\infty}(1+r)^{-i}E_{t}\left(Y_{t+i}-I_{t+i}-G_{t+i}\right)\right] \tag{6}$$

Define the current account (CA_t) as:

$$CA_{t}=(Y_{t}-I_{t}-G_{t})-C_{t}+rF_{t} \tag{7}$$

Substituting Eq. (6) into eq. (7) gives:

$$CA_{t}=-\sum_{i=1}^{\infty}\left[(1+r)^{-i}E_{t}\Delta\left(Y_{t+i}-I_{t+i}-G_{t+i}\right)\right] \tag{8}$$

Eq. (8) gives an intertemporal model of current account. Accordingly, the current account is represented as the discounted sum of expected changes in $(Y_t-I_t-G_t)$.[67] The interpretation of Eq. (8) is straight forward: foreign saving increases if output net of investment and government spending is expected to fall in future. This interpretation is analogous to the saving model of Campbell (1987) in which people save more in anticipation of a fall in future income. Eq. (8) has an important econometric implication. That is, if $(Y_t-I_t-G_t)$ can be characterized as an $I(1)$ process, then $\Delta(Y_t-I_t-G_t)$ will be $I(0)$, and therefore CA_t will be stationary.

According to national account identity, GNP is defined as the sum of consumption (C_t), investment (I_t), government spending (G_t), exports (X_t) minus imports (M_t), and net factor income from abroad ($NFIA_t$):

$$GNP_{t}=C_{t}+I_{t}+G_{t}+(X_{t}-M_{t})+NFIA_{t} \tag{9}$$

[67] Using a slightly different approach, this model has also been derived by Otto (1992) and Ghosh (1995).

Given that CA_t is defined as $(X_t - M_t) + NFIA_t$, and saving (S_t) is defined as $GNP_t - C_t - G_t$, it follows that the current account can be expressed as saving minus investment:

$$CA_t = S_t - I_t \tag{10}$$

Since the current account balance is obtained by subtracting investment from saving, these two variables should be cointegrated with a vector [1 –1], irrespective of the degree of capital mobility. Thus, the theory here implies that saving and investment should be cointegrated, even if capital is perfectly immobile.[68]

8.4 Model and Data

8.4.1 Model specification

Feldstein and Horioka (1980) adopt the following simple static specification to examine the saving-investment link.

$$(I/Y)_t = \alpha + \beta(S/Y)_t + \varepsilon_t \tag{11}$$

where $(I/Y)_t$ and $(S/Y)_t$ are the shares of gross domestic investment and gross domestic saving in output. However, such a simple econometric specification is subject to the problems of omitted lagged variable bias since no dynamics are included in the specification (Banerjee, Dolado, Hendry and Smith, 1986). Furthermore, if $(I/Y)_t$ and $(S/Y)_t$ contain unit roots, then regressing Eq. (11) in levels may produce "spurious" regression results (Granger and Newbold, 1974).

In view of these, a dynamic specification in the form of an unrestricted ECM is adopted to estimate the long-run relationship between domestic saving and investment rates:

$$\begin{aligned}(I/Y)_t = {} & \alpha_0 + \beta_1 D_{98\text{-}03} + \beta_2 (S/Y)_t + \sum_{i=0}^{p} \gamma_{1i} \Delta (I/Y)_{t-i} \\ & + \sum_{i=0}^{p} \gamma_{2i} \Delta (S/Y)_{t-i} + \sum_{i=0}^{p} \gamma_{2i} \Delta D_{98\text{-}03} \mathrm{x} (S/Y)_{t-i} + u_t\end{aligned} \tag{12}$$

A step dummy and a slope dummy are included in the specification to account for the adoption of the capital control regime for the period 1998-2003. Incidentally, this period coincides with the structural break observed in the investment series due to the catastrophic effects of the Asian financial crisis. The dynamic specification in Eq.

[68] Assuming that saving and investment are random walk processes, the alternative approach proposed by Levy (2000) suggests that if $S_t \sim I(1)$ and $I_t \sim I(1)$, then saving and investment will be cointegrated with cointegrating vector [1 –1].

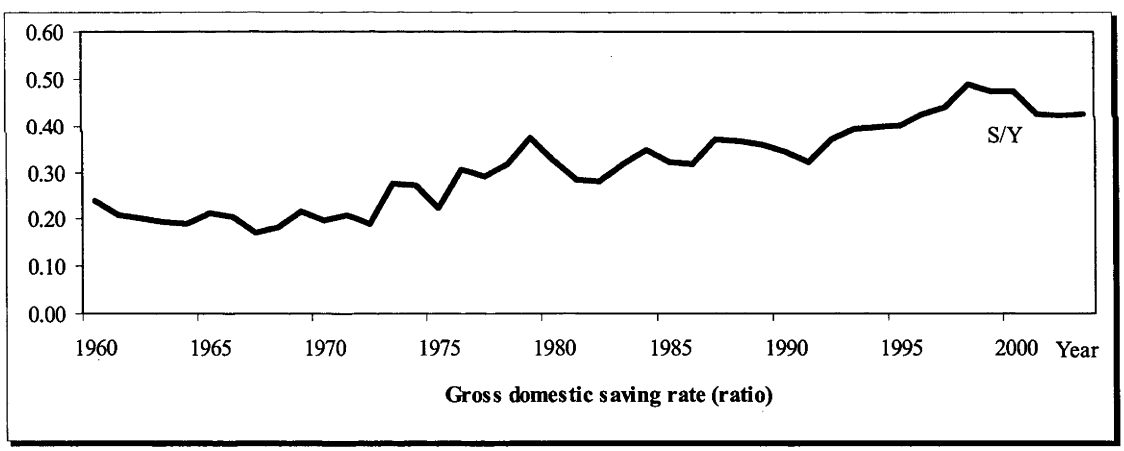
(12) allows for a possible shift in the function and a change in the coefficients due to these specific events.

8.4.2 Time series plots of variables

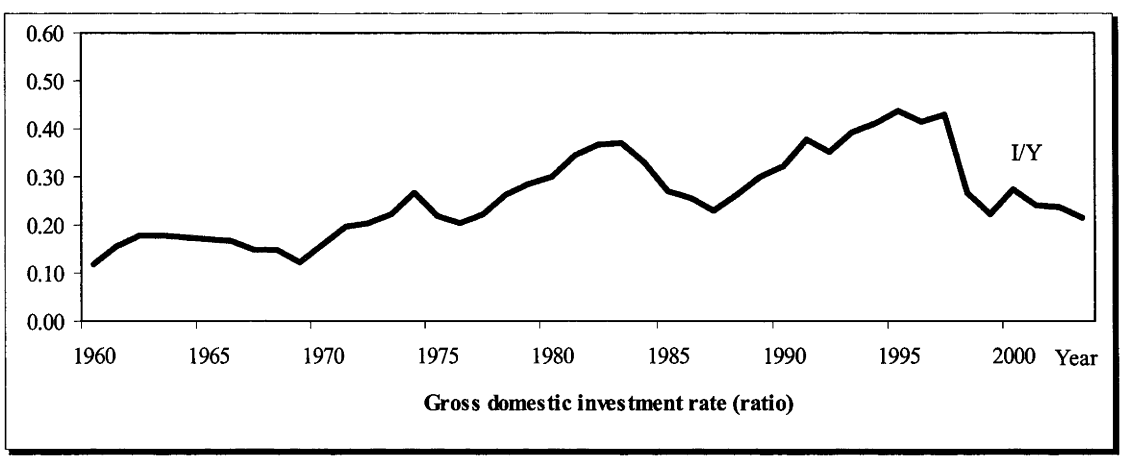
Figure 8.1 presents the time series plots of gross domestic saving rate $(S/Y)_t$ and gross domestic investment rate $(I/Y)_t$. Gross domestic investment refers to the sum of private fixed capital formation, public fixed capital formation and change in stocks. Gross domestic saving is defined as the total saving of the private and public sector.

It is clear that both series have increased significantly over time. The share of gross domestic saving to GDP rose from just 26 per cent in 1960 to 43 per cent in 1996, before the onset of the Asian financial crisis. Gross domestic investment increased from 14 per cent of GDP to 42 per cent of GDP during the same period. Both $(S/Y)_t$ and $(I/Y)_t$ have declined during the post-crisis period of 1998-03, but a more substantial decline is observed in $(I/Y)_t$, as highlighted in Chapters 3 and 7 previously.

Figure 8.1: Time series plots of variables



Notes: S/Y = gross domestic saving/GDP.



Notes: I/Y = gross domestic investment/GDP.

8.5 Empirical Findings

8.5.1 ARDL cointegration test

The results of the ARDL bounds test reported in Table 8.1 indicate that the null hypothesis that there is no cointegration between $\ln(S/Y)_t$ and $\ln(I/Y)_t$ is rejected at the 10% significance level. With regard to the choice of lag length, the results are ambiguous since AIC prefers two lags whereas SBC suggests a simpler dynamic specification of one lag.

Table 8.1: ARDL bounds tests and lag length selection

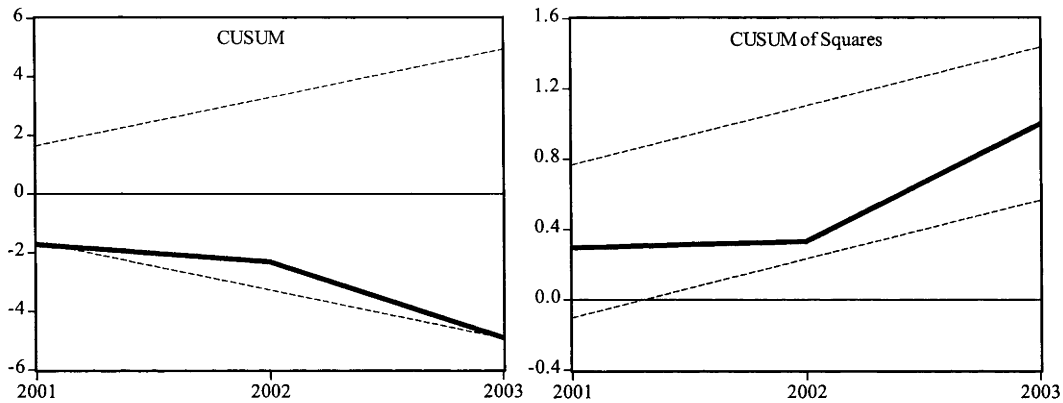
	$p=1$	$p=2$
	ARDL bounds tests	
F-statistic	5.594*	6.334**
t-statistic	-3.322**	-3.547**
	Lag length selection criteria	
AIC	-1.457	-1.497
SBC	-1.085	-0.996

*Notes: p is the optimal lag length for the conditional ECM. $AIC=-2(ll/T)+2(k/T)$ and $SBC=-2(ll/T)+(k/T)(\ln T)$, where ll is the maximized log-likelihood value of the model at lag p, k is the number of estimated coefficients, and T is the sample size. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (2001), and the null hypothesis is that there is no long-run relationship.*

8.5.2 Diagnostic checks

The regression specifications reported in Table 8.2 pass the diagnostic tests against non-normal residuals, serial correlation, heteroskedasticity and the regression specification error test, at the 5% level of significance, but not the autoregressive conditional heteroskedasticity test. The CUSUM and CUSUM of squares tests on the recursive residuals suggest no structural instability in the residuals of the investment rate equation, given that the statistics lie within or on the 5% confidence interval bands (see Figure 8.2).

Figure 8.2: Plots of CUSUM and CUSUM of squares recursive residuals



8.5.3 The long-run relationship and short-run dynamics

Panel A of Table 8.2 shows both $\ln(S/Y)_t$ and D_{98-03} enter the long-run equation significantly at the 1% level. The elasticity of investment rate with respect to saving rate is found to be around 1.2 in the long-run, suggesting a positive long-run relationship between the saving and investment rates. The findings of a robust long-run cointegrated relationship suggest that any change in domestic saving will be closely associated with a change in domestic investment. Hence, financial sector policies targeted at mobilizing domestic saving are critical for capital accumulation. However, it should also be noted that over-reliance on domestic saving may limit an economy's growth opportunity. As such, policy makers should also focus on attracting foreign capital as part of the development policy while mobilizing resources in the domestic economy. Policy makers should ensure that these additional foreign resources are channelled to productive sectors and utilized efficiently for sustained development.

The dummy variable used to capture the effect of the capital control regime is found to have a negative effect on the investment rate. The results are not surprising given that the investment rate plunged after the Asian financial crisis, coinciding with the adoption of a capital control regime.

The regression results for the short-run model, reported in panel B of Table 8.2, show that except for the intercept, all coefficients are statistically significant at the 10% level. In first-differenced form, both $\Delta\ln(S/Y)_t$ and $\Delta D_{98\text{-}03}\text{x}\ln(S/Y)_t$ have the appropriate signs.

The coefficient on ECT_{t-1}, which measures the speed of adjustment back to the long-run equilibrium value, is statistically significant at the 1% level and correctly signed, i.e., negative, implying that an error correction mechanism exists. The speed of

adjustment at 46.1 per cent a year suggests that it takes only about two years to achieve long-run equilibrium whenever there is a deviation from the long-run steady state.

Table 8.2: Long-run and short-run results of the investment rate equation

	A. The long-run equilibrium level relationship	
	Coefficient	*p*-value
Intercept	0.133	0.215
$\ln(S/Y)_t$	1.205***	0.000
$D_{98\text{-}03}$	-0.477***	0.000
	B. The short-run dynamic model	
	Coefficient	*p*-value
Intercept	-0.002	0.913
ECT_{t-1}	-0.461***	0.000
$\Delta\ln(S/Y)_t$	0.269*	0.081
$\Delta D_{98\text{-}03}\text{x}\ln(S/Y)_t$	0.704***	0.000
$\Delta\ln(I/Y)_{t-1}$	0.360***	0.005
$\Delta\ln(I/Y)_{t-2}$	0.281*	0.061
$\Delta D_{98\text{-}03}\text{x}\ln(S/Y)_{t-2}$	-0.361**	0.039
Diagnostic checks	Test-statistic	*p*-value
$\chi^2_{NORMAL}(2)$	0.575	0.750
$\chi^2_{SERIAL}(1)$	0.454	0.500
$\chi^2_{SERIAL}(2)$	1.237	0.538
$\chi^2_{ARCH}(1)$	4.099**	0.042
χ^2_{WHITE}	10.109	0.606
$\chi^2_{RESET}(1)$	0.368	0.544

*Notes: The regressions for the long-run model are based on an unrestricted ECM, and corrected for both omitted lagged variable bias and endogeneity bias. The regressions for the short-run dynamic model are based on a conditional ECM. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.* $\chi^2_{NORMAL}(2)$ *refers to the Jarque-Bera statistic of the test for normal residuals,* $\chi^2_{SERIAL}(1)$ *and* $\chi^2_{SERIAL}(2)$ *are the Breusch-Godfrey LM test statistics for no first and second order serial correlation, respectively,* χ^2_{WHITE} *denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients,* $\chi^2_{ARCH}(1)$ *is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and* $\chi^2_{RESET}(1)$ *is the Ramsey's test statistic for no functional misspecification.*

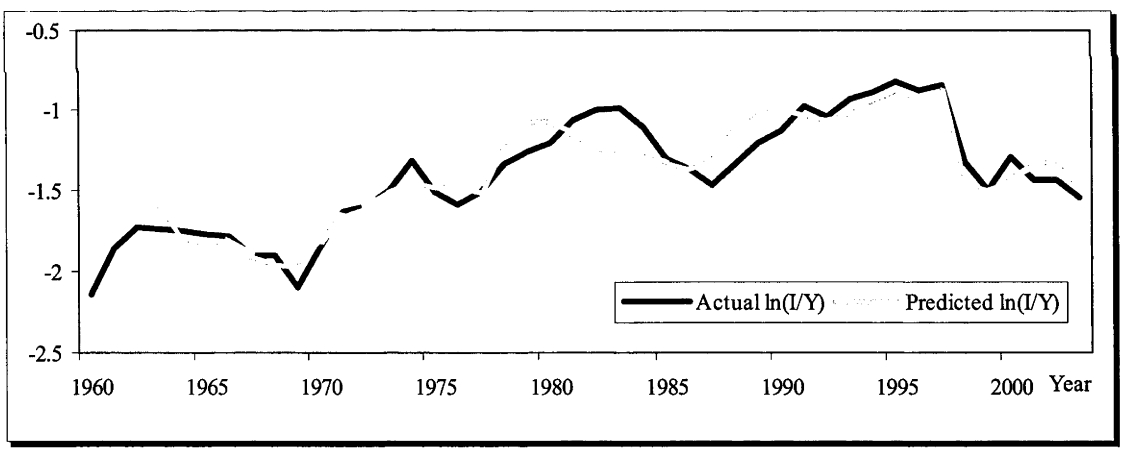
Contrary to the findings of Jansen and Schulze (1996) and Payne (2005), who have reported a negative relationship between domestic saving and investment rates, the contemporaneous saving variable enters the equation with a positive sign. Specifically, a one percentage point increase in $\Delta\ln(S/Y)_t$ leads to a 0.269 percentage point increase in $\Delta\ln(I/Y)_t$. As the standard intertemporal open economy model implies, saving and investment should be cointegrated irrespective of the degree of capital mobility, given that current account imbalances are unsustainable. Consequently, the short-run

correlation is more indicative about the degree of capital immobility. The positive coefficient on $\Delta D_{98\text{-}03}\text{x}\ln(S/Y)_t$ suggests that the correlation greatly strengthens during the increased capital immobility period, providing some evidence that the Feldstein-Horioka approach is partially informative about the level of capital mobility. Another interesting finding is that the long-run saving-investment relationship is stronger than that of the short-run, consistent with the results of Levy (2000).

Thus, the results suggest that the "Feldstein-Horioka puzzle" is not applicable to the Malaysian experience since the adoption of a capital control regime from 1998 onwards coincides with an increased value of the saving-investment correlation. On the whole, these results are consistent with the time series findings of Jansen and Schulze (1996), Moreno (1997), De Vita and Abbott (2002) and Narayan (2005), who have found little support for the "Feldstein-Horioka puzzle".[69]

Figure 8.3 shows the actual and predicted level of investment rate. Predicted $\ln(I/Y)_t$, the long-run (static) equilibrium levels of investment rate, follows the actual series very closely over time.

Figure 8.3: Actual and predicted investment rate series



8.6 Conclusion

This chapter examines the relationship between the domestic saving and investment rates in a cointegration framework. The ARDL cointegration tests indicate a fairly robust long-run relationship between the domestic saving and investment rates, with a cointegrating vector [1 -1.2]. The findings suggest that the degree of association between these two variables found in the time series data is consistent with the degree

[69] The magnitudes of the long-run coefficients are found to be 0.31-037 for Noway (Jansen and Schulze, 1996), 0.20-0.93 for the U.S. (De Vita and Abbott, 2002), and 0.69 for Japan (Narayan, 2005).

of capital mobility. The results show that the saving-investment relationship is stronger when capital controls are present in Malaysia, implying an increasing isolation from international capital markets. Thus, the close relationship between saving and investment observed in Malaysia does not represent a "puzzle". It can be inferred from the results that capital accumulation channel through which financial development can impact on economic growth is present for the Malaysian experience.

CHAPTER 9: FINANCIAL INTERMEDIATION AND ECONOMIC GROWTH

9.1 Introduction

The neoclassical growth model of Solow (1956) and Swan (1956) postulates two major sources that contribute to economic growth: accumulation of factors of production and productivity growth (technological progress). In principle, an improvement in the financial systems can affect economic growth via these two channels: the capital accumulation channel and the total factor productivity (TFP) channel. In this thesis, these two channels are examined separately in the context of Malaysia.

The first channel, also known as the quantitative channel, is rather straight forward. Economic growth depends on capital accumulation through both domestic and foreign capital investment. To mobilize savings and channel them to capital accumulation, an efficient financial system is essential. In this way, financial development and economic growth are linked. The empirical evidence presented in Chapters 6 and 7 has highlighted that financial development positively affects both saving behaviour and investment activities in Malaysia. Given that saving and investment are strongly connected, as shown in Chapter 8, it can be inferred that financial development leads to higher economic growth via the capital accumulation channel.

The TFP channel, which is referred to as the qualitative channel, suggests that an efficient financial system facilitates the adoption of modern technology to boost development of the knowledge- and technology-intensive industries, through the provision of efficient credit facilities and other financial services. Testing whether this channel exists in the Malaysian economy is the central focus of this chapter. The standard augmented neoclassical growth model is used to examine to what extent financial development contributes to output expansion in Malaysia.

The chapter is divided into five sections. In section 9.2, a growth accounting exercise for Malaysia is performed. Section 9.3 sets out the empirical model and describes the data. Section 9.4 provides and discusses the empirical results. Finally, the last section concludes.

9.2 Growth Accounting

An efficient financial system performs the task of screening investment projects. With an effective risk evaluation on different investment opportunities, the selection of the most promising investment projects could improve the quality of investments, reduce business failures, and effectively raise productivity (Greenwood and Jovanovic, 1990). To assess the impact of financial intermediation via the productivity channel, this study assumes that the effect of financial intermediation on the economy operates through TFP. That is, TFP = f (financial intermediation). Thus, examining the contribution of TFP to growth provides some indication about the influence of financial intermediation in the process of economic development, via the productivity channel.

Growth accounting is the standard approach used to segregate the growth in real output into the growth in productivity and the growth in factor inputs. Deriving the growth accounting equation begins with a Cobb-Douglas production function in the form:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \tag{1}$$

where Y_t is the aggregate level of output, A_t indicates the level of technology, K_t refers to physical capital, L_t is the labour force, and α and β are the shares of factor inputs in production. Taking logarithms and first differencing gives the following growth accounting equation:

$$\Delta \ln Y_t = \Delta \ln A_t + \alpha \Delta \ln K_t + \beta \Delta \ln L_t \tag{2}$$

or

$$\hat{Y}_t = \hat{A}_t + \alpha \hat{K}_t + \beta \hat{L}_t \tag{3}$$

where the 'hat' sign represents growth rates. The production function is assumed to display constant returns to scale so that α and β sum to one. With the assumption of perfect competition in the factor markets, each factor is paid the value of its marginal product so that α and β can be approximated by the shares of capital and labour in total output, respectively. From Eq. (3), $\hat{A}_t$ or TFP growth can be obtained by:

$$\hat{A}_t = \hat{Y}_t - \alpha \hat{K}_t - \beta \hat{L}_t \tag{4}$$

Eq. (4) shows that TFP growth is calculated as a residual, which is the portion of output growth not accounted for by inputs growth. This is also known as the 'Solow residual'. It is important to highlight that this conventional approach does not take into consideration any changes in the quality of physical capital and work force due to the

lack of appropriate data. Human capital stocks are not accounted for due to the same reason.

Next, an estimate of α is needed. As mentioned earlier, in a competitive economy, α can be given by the share of income earned by capital, and it should vary across time. However, as in most developing countries and even some developed countries, reliable measures of factor income are not available. In a growth accounting exercise, Young (1995) estimates a capital share of 0.37 for Hong Kong, 0.49 for Singapore, 0.3 for Korea, and 0.26 for Taiwan. Ghani and Suri (1999) assume a capital share 0.33 in their analysis of productivity growth in Malaysia for the period 1970-97. Sarel (1997) estimates the value of capital share for Malaysia to be around 0.32 for the period 1978-96. In the analysis of Collins and Bosworth (1996), a uniform capital share of 0.35 is used in their entire analysis for selected Asian economies. Using the results of Collins and Bosworth (1996) and Sarel (1997) as the benchmark, Nazrin (2000) assumes the capital share for Malaysia to be 0.3. This estimate is also in line with the assumption of King and Levine (1993a) in their seminal study of the broad relationship between financial development and economic growth. Based on these studies, the capital share estimates (α) in this analysis are assumed to be in the range of 0.25-0.35. As a sensitivity check, the value of α is varied with an increment of 0.05.

The period under study is broken into four sub-periods: 1961-70, 1971-84, 1985-97 and 1998-03. The period 1961-70 can be characterized as a highly uncertain period. The economy faced several challenges: an unstable export sector, the confrontation with Indonesia in the early 1960s, the separation of Singapore in 1965, and the racial riots in 1969 (Hasan, 1980). The next period 1971-84 marked the inception of the NEP. The economy underwent a rapid industrialization process before it went into recession in 1985. The period 1985-97 marked another rapid growth phase, after the economy recovered from the economic setback in 1985. Growth in this period was mainly driven by a boom in the export sector. The economy continued to perform very well before it was hit by the 1997-98 Asian financial crisis. Finally, post-crisis 1997-03 saw a recovery of the economy from the crisis.[70]

The results of the growth accounting exercise are presented in Table 9.1. Except for the post-crisis period, capital stocks grew at a rapid rate of higher than 9 per cent on average per year in each period. Growth rates of the labour force remained quite stable at around 3 per cent. Consistent with the declines in GDP growth rates, both factors of production and productivity grew at a much lower rate during the period 1997-03 due to

[70] See Chapter 3 for more details.

the effects of the crisis. Productivity growth increased strongly over the past four decades, but it slowed significantly and recorded zero growth during the post-crisis period. For the entire period, TFP growth averaged between 1.37 and 1.91 per cent, depending on the assumption about the capital share in income (α). These TFP growth estimates seem reasonable compared to the findings of other studies (see Table 9.2). Overall, it appears that the patterns of change of the growth rates of productivity and factor inputs are not very sensitive to the value of α.

Table 9.1: Average annual rate of growth (%)

Period	Output	Capital	Labour	TFP		
				$\alpha = 0.25$	$\alpha = 0.30$	$\alpha = 0.35$
1961-70	6.28	9.60	2.84	1.76	1.41	1.08
1971-84	7.25	9.82	3.39	2.26	1.93	1.61
1985-97	7.22	9.24	3.15	2.55	2.24	1.94
1998-03	2.72	2.32	2.87	-0.01	0.01	0.04
1961-03	6.38	8.55	3.12	1.91	1.64	1.37

Table 9.2: Estimates of TFP growth in Malaysia

Author(s)	Period	Annual rate of TFP growth
Collins and Bosworth (1996)	1960–94	0.4-1.4%
Dowling and Summers (1998)	1961–95	1.5-2.5%
Klenow and Rodriguez-Clare (1997)	1960–85	2.0%
Nazrin (2000)	1975-97	1.9%
Sarel (1997)	1978-96	2.0%
WorldBank (1993)	1960–89	1.5-1.6%
Young (1994a)	1970–85	1.1%

Estimates of the contribution of growth of factor inputs and TFP to output expansion in the four sub-periods are given in Table 9.3. The contribution from labour has remained very stable, except for the period 1997-03. However, the contribution from capital shows a declining trend over the years. In contrast, TFP has become increasingly important in contributing to output growth over the years. These patterns of change are not affected by the Asian financial crisis. The estimates suggest that the

contribution of capital accumulation has been substituted by the contribution from productivity. For the entire period, growth does not seem to have been driven solely by capital and labour inputs. The results are in line with Sarel (1997) and Nazrin (2000), who find a very impressive growth rate of TFP for Malaysia. Consequently, financial development may have played a critical role in driving economic growth in Malaysia through enhancing productivity gains.

Table 9.3: Contribution to GDP growth (%)

Sources of growth	1961-70	1971-84	1985-96	1997-03	1961-03
			$\alpha = 0.25$		
Capital	34.7	33.5	32.1	28.1	32.6
Labour	33.8	34.2	34.5	29.5	36.7
TFP	31.5	32.7	33.4	42.4	30.7
			$\alpha = 0.3$		
Capital	41.6	39.7	34.7	20.2	39.1
Labour	31.6	31.9	27.8	41.7	34.2
TFP	26.8	28.4	37.5	38.0	26.6
			$\alpha = 0.35$		
Capital	48.6	46.3	40.5	23.6	45.7
Labour	29.3	29.7	25.8	38.8	31.8
TFP	22.1	24.0	33.7	37.6	22.6

9.3 Model and Data

9.3.1 Model specification

As highlighted in the preceding section, the effect of financial intermediation on the economy is assumed to operate through TFP. Following an analysis of the sources of growth in Malaysia through a growth accounting framework, this section describes model used to test the productivity channel. The growth model draws upon the standard neoclassical model, augmented with financial deepening. In this way, financial development is assumed to affect growth via the productivity channel. The rationale for this specification is simple: if financial deepening affects economic development solely through the factor accumulation channel, financial deepening should not be expected to

appear significantly in the augmented neoclassical growth model, since it is already captured in physical capital stocks (Benhabib and Spiegel, 2000).

Capital stock is decomposed into private and public capital stocks. The segregation of total capital stocks is important, given that private and public capital stocks may have different effects on output expansion, as highlighted by a number of authors (see Aschauer, 1989a, b; Baltagi and Pinnoi, 1995; and Holtz-Eakin, 1994, among others). Private capital stocks, which arise from investment in the private sector such as machinery and equipment, are likely to have a positive role to play in enhancing growth through the adoption of new technologies in the production process. Aschauer (1989a) argues that public sector capital, such as infrastructure, may complement private sector capital and therefore contribute positively to output expansion. However, if the public sector is associated with waste and inefficiency, this may affect the quality of public infrastructure, thereby retarding output growth. Hence, how public capital stocks affect real output is ambiguous.

The empirical specifications of the real output equation are given in Eq. (5) and Eq. (6).

$$GDP_t = f_A(PRK_t, PUK_t, LF_t, PC_t) \tag{5}$$

$$GDP_t = f_B(PRK_t, PUK_t, LF_t, MON_t) \tag{6}$$

where GDP_t is the aggregate output measured at 1987 prices. The independent variables, with the expected signs in the parentheses, are given as:

PRK_t = real private capital stocks (+)
PUK_t = real public capital stocks (?)
LF_t = labour force (+)
PC_t = financial deepening measured by private credit to GDP (+)
MON_t = financial deepening measured by M2 to GDP (+)

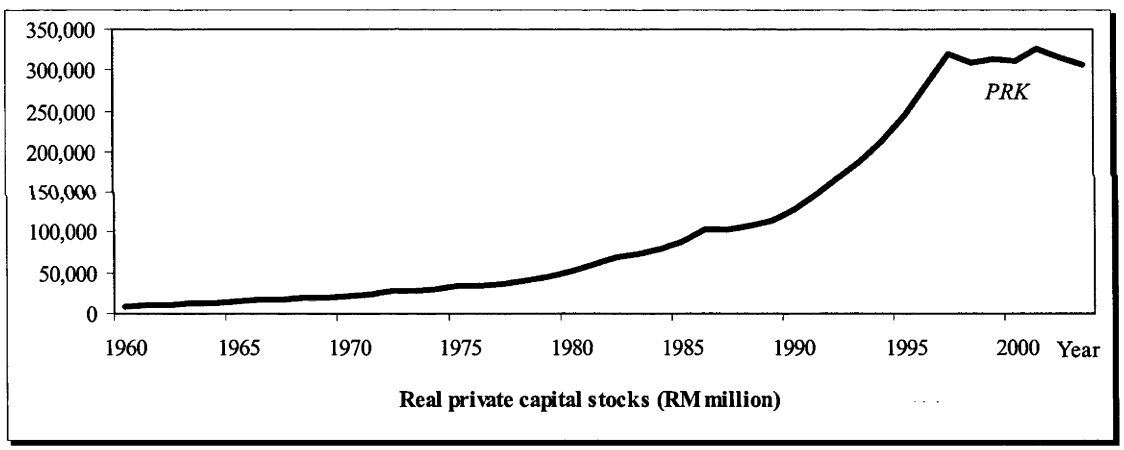
All variables are converted into natural logarithms. As in Chapter 5, two different indicators of financial development are used in the estimation to provide a sensitivity check on the results. The specifications include two dummy variables to account for the impacts of the global economic recession in 1985-86 and the 1997-98 Asian financial crisis, defined as:

$$D_{85-86} = \begin{cases} 1 & \text{if } t = 1985-86 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad D_{97-98} = \begin{cases} 1 & \text{if } t = 1997-98 \\ 0 & \text{otherwise} \end{cases}$$

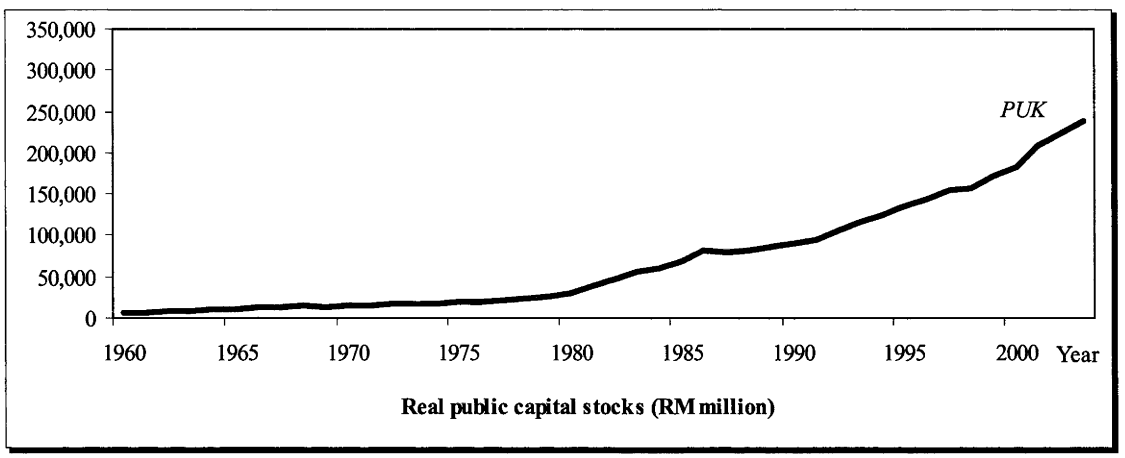
9.3.2 Time series plots of variables

The time series plots of the variables used in this analysis are presented in Figure 9.1. These series are presented in their original forms before taking logarithms. The behaviours of GDP_t and the two financial development indicators, i.e., PC_t and MON_t, have been described in Chapter 5 and will not be repeated here. As the figures make clear, both PRK_t and PUK_t have shown a steady rising trend over the period 1960-2003. However, the increase in PRK_t is moderated significantly during the post-crisis period whereas PUK_t has continued to show an upward trend due to the ongoing pump-priming efforts of the government. This highlights the importance of treating these two variables separately in the estimation. LF_t has shown a very smooth increasing trend over the entire period under investigation.

Figure 9.1: Time series plots of variables



Notes: PRK = private capital stocks/gross capital formation deflator.



Notes: PUK = public capital stocks/gross capital formation deflator.

Notes: LF refers to all individuals willing to supply labour for the production of goods and services during a specified period.

9.4 Results

9.4.1 ARDL cointegration test

A conditional ECM is estimated with one and two lags for each model to perform the ARDL cointegration tests. The results in Table 9.4 indicate that the null hypothesis that there exists no level output equation is rejected at the 5% significance level for both models when one lag is chosen. In line with the results of the bounds test, both AIC and SBC prefer a simpler dynamic specification of one lag for Model A. For Model B, the results show that AIC favours modelling with two lags whereas SBC point to specifying the model with only one lag. The results are not surprising given that SBC always tends to select a model with less dynamics.

Table 9.4: ARDL bounds tests and lag length selection

	Model A (Dep. = $\Delta \ln PC_t$)		Model B (Dep. = $\Delta \ln MON_t$)	
	$p=1$	$p=2$	$p=1$	$p=2$
	ARDL bounds tests			
F-statistic	5.772***	3.472	4.377**	3.023
t-statistic	-4.672***	-2.278	-4.025**	-2.059
	Lag length selection criteria			
AIC	-4.417	-3.755	-4.401	-4.448
SBC	-4.536	-3.659	-3.739	-3.570

*Notes: p is the optimal lag length for the conditional ECM. $AIC = -2(ll/T) + 2(k/T)$ and $SBC = -2(ll/T) + (k/T)(\ln T)$, where ll is the maximized log-likelihood value of the model at lag p, k is the number of estimated coefficients, and T is the sample size. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin and Smith (2001), and the null hypothesis is that there is no long-run relationship.*

9.4.2 Diagnostic checks

The regression results for the conditional ECM of $\Delta \ln GDP_t$ show several desirable statistical features. The regression specification fits remarkably well and passes the diagnostic tests against non-normal residuals, serial correlation, heteroskedasticity, and autoregressive conditional heteroskedasticity at the 5% level of significance. However, the model does not pass the functional form regression specification error test (or Ramsey's RESET test) at the 1% level.

Figure 9.2: Plots of CUSUM and CUSUM of squares recursive residuals

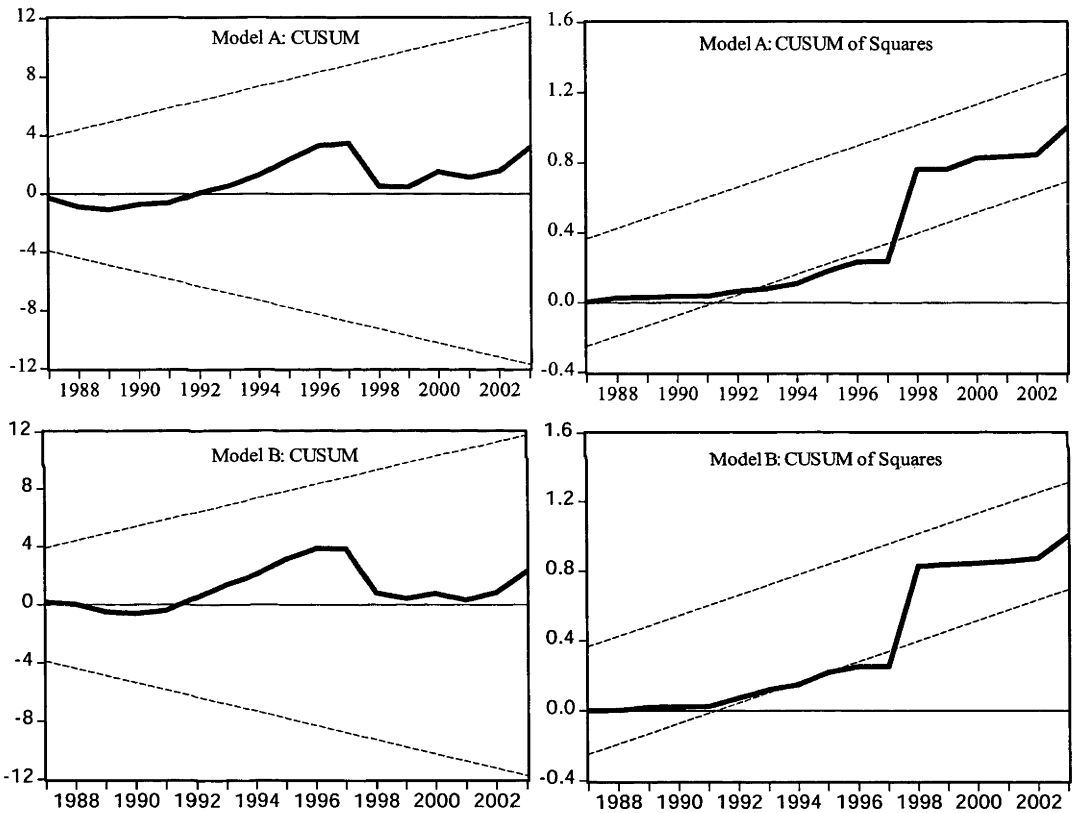


Figure 9.2 displays the CUSUM and CUSUM of squares results, respectively. In the former, the statistic lies within the 5% confidence interval bands in both models throughout the period after the global economic recession, suggesting no structural instability in the residuals of the output equation. In the latter, some structural instability is found in the residuals. Nevertheless, the test statistics are generally within the 5% confidence interval band, suggesting that the residuals are somewhat stable.

9.4.3 The long-run relationship and short-run dynamics

The estimated long-run relationships reported in panel A of Table 9.5 show that all variables are statistically significantly at the 1% level. Specifically, the results show that capital accumulation has a mixed influence on output expansion. A one percentage point increase in private capital stocks leads to a 0.378 to 0.388 percentage point increase in output, whereas a one percentage point increase in public capital stocks leads to a 0.281 to 0.322 percentage point reduction in output. The finding of a positive effect of private capita stocks provide some support for the view that financial deepening impacts on economic growth through the capital accumulation channel.

The evidence presented here seems to suggest that public sector intervention in the economy appears to be harmful for long-term economic development.[71] This has much to do with the implementation of the NEP. Several arguments have been put forward to support this point of view. State sponsorship for heavy industry has been seen as a way to strengthen the economic position of native-Malays to better achieve the targets set by the NEP. This brings opportunities for *bumiputras* to secure key managerial positions to help achieve ethnic redistributive targets. However, the public sector in Malaysia appears to be associated with waste, inefficiency and corruption. This may distort the decision-making process connected with public investment expenditure and result in lower quality of public infrastructure (Tanzi and Davoodi, 1997).

Crouch (1996) argues that although the NEP has succeeded in bringing *bumiputras* into business, it is unable to promote the development of an independent *bumiputra* entrepreneur class since they are mainly concerned with maintaining individual links with political patrons. In analysing the effectiveness of the NEP, Mehmet (1988) finds that it has little impact on poverty eradication. Gomez (1990) reports a similar finding that state involvement in business has not contributed much to the development of productive activities. Instead, it has resulted in the transfer of paper wealth from one company to another in the interests of the politically well-connected few. Searle (1999) concludes that while government intervention by way of the NEP has not created new sources of entrepreneurship that contribute to the economy, these interventions have fostered more rent seeking activities which are harmful for the development of the economy. Given the above, low-quality government intervention in

[71] In view that the results may be sensitive to the sample period covered, the pre-crisis period (1960-1996) has also been considered in the estimation. While the results show some variations in the magnitudes of the coefficients obtained, the finding that public capital stock exerts an undesirable effect on aggregate output remains unaltered. Hence, it appears that the results are not significantly affected by the crisis episode. This is consistent with the finding that the Asian financial crisis dummy is insignificant.

the economy appears to have resulted in more rent-seeking activities and wasteful resources, and therefore capital formation in the public sector is unlikely to generate long-term growth in Malaysia.

Table 9.5: Long-run and short-run results of the output equations

	A. The long-run equilibrium level relationship			
	Model A (Dep. = $\ln GDP_t$)		Model B (Dep. = $\ln GDP_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	7.629***	0.000	7.791***	0.000
$\ln PRK_t$	0.378***	0.000	0.388***	0.000
$\ln PUK_t$	-0.322***	0.000	-0.281***	0.000
$\ln LF_t$	1.674***	0.000	1.329***	0.000
$\ln PC_t$	0.096***	0.001		
$\ln MON_t$			0.334***	0.007
$D_{85\text{-}86}$	-0.097***	0.000	-0.060**	0.030
	B. The short-run dynamic model			
	Model A (Dep. = $\Delta \ln GDP_t$)		Model B (Dep. = $\Delta \ln GDP_t$)	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	-0.044**	0.024	-0.013	0.440
ECT_{t-1}	-0.661***	0.000	-0.544***	0.000
$\Delta \ln PRK_t$	0.817***	0.000	0.824***	0.000
$\Delta \ln PUK_t$	-0.691***	0.000	-0.628***	0.000
$\Delta \ln PC_t$	0.049	0.133		
$\Delta \ln PRK_{t-1}$	-0.489***	0.000	-0.421***	0.002
$\Delta \ln PUK_{t-1}$	0.632***	0.000	0.496***	0.000
Diagnostic checks	Test-statistic	*p*-value	Test-statistic	*p*-value
$\chi^2_{NORMAL}(2)$	4.963*	0.084	3.557	0.169
$\chi^2_{SERIAL}(1)$	0.538	0.463	0.119	0.731
$\chi^2_{SERIAL}(2)$	3.555	0.169	2.685	0.261
$\chi^2_{ARCH}(1)$	0.937	0.333	0.930	0.335
χ^2_{WHITE}	14.046	0.371	15.989	0.142
$\chi^2_{RESET}(1)$	24.212***	0.000	24.642***	0.000

*Notes: The regressions for the long-run model are based on an unrestricted ECM, and corrected for both omitted lagged variable bias and endogeneity bias. The regressions for the short-run dynamic model are based on a conditional ECM. *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.* $\chi^2_{NORMAL}(2)$ *refers to the Jarque-Bera statistic of the test for normal residuals,* $\chi^2_{SERIAL}(1)$ *and* $\chi^2_{SERIAL}(2)$ *are the Breusch-Godfrey LM test statistics for no first and second order serial correlation, respectively,* χ^2_{WHITE} *denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients,* $\chi^2_{ARCH}(1)$ *is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and* $\chi^2_{RESET}(1)$ *is the Ramsey's test statistic for no functional misspecification.*

Labour input is found to have a positive impact on real output, with a long-run elasticity of 1.674 for Model A and 1.329 for Model B. The results seem to suggest a high growth rate in the labour force is conducive to economic growth in Malaysia.

The elasticity of output with respect to financial deepening is 0.096 based on the results of Model A, suggesting that the influence of financial deepening on output is quite small. This impact is found to be much larger in Model B, with a long-run elasticity of 0.334. The finding that financial deepening positively influences economic development via the TFP channel is consistent with the results of Yaakop (1988) for the Malaysian experience during the period 1960-85. The results are also broadly in line with the findings of Benhabib and Spiegel (2000), De Gregorio and Guidotti (1995) and Rioja and Valev (2004).[72]

The results lend some support to the endogenous finance and growth theory, which postulates that financial development acts as a mechanism in facilitating the adoption of new technologies in the domestic economy. Thus, the provision of efficient credit and financial services by the Malaysian financial system appears to have greatly facilitated technological transfer and induced spillover efficiency. Given that evolution of the financial system may affect the speed of technological accumulation and innovations, it is essential to develop a sound financial system in order to reap these efficiency gains and achieve sustained economic growth in the long-run.

The coefficient on $D_{85\text{-}86}$ is found to be negative, implying that the world economic recession in 1985-86 had a negative impact on output. The dummy variable which captures the effect of the Asian financial crisis, i.e., $D_{97\text{-}98}$, is found to be statistically insignificant, and therefore dropped from the estimation.

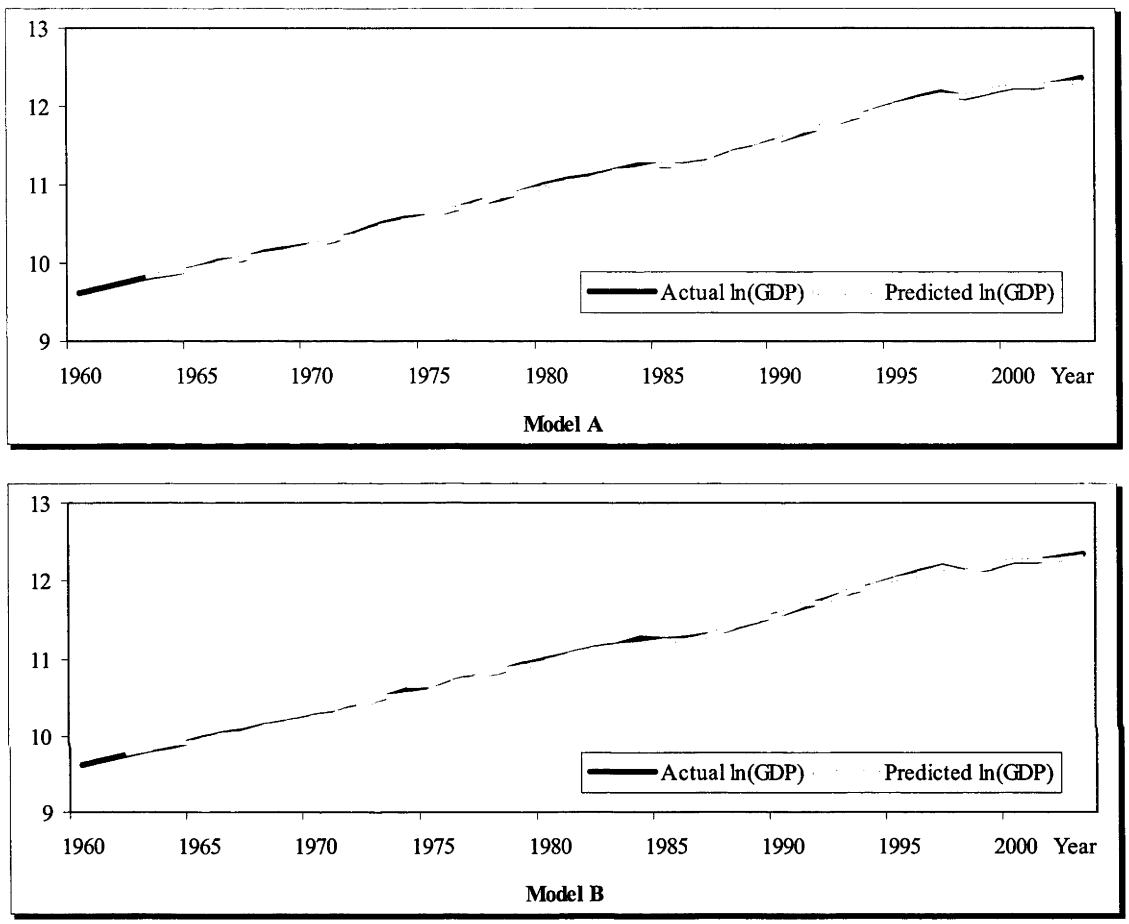
Interestingly, the short-run impacts of both private and public capital formation are consistent with the long-run results. No short-run inference on labour force and financial deepening can be drawn, since in first-differenced forms these variables are found to be statistically insignificant.

The coefficients associated with ECT_{t-1} are statistically significant at the 1% level and has the right sign. Their magnitudes imply that the economy takes less than two years to achieve long-run equilibrium whenever there is a deviation from equilibrium. The statistical significance of the ECT also provides further evidence

[72] As a robustness check, the output equation has also been controlled for human capital and trade openness. However, the results show that these variables are statistically insignificant at the conventional level. Hence, the finding that financial deepening enhances growth through the productivity channel seems highly plausible.

against no cointegration between real output and its determinants. It is apparent from Figure 9.3 that the patterns of the predicted series follow very closely with those of the actual series, providing some support that the models are rather well-fitted.

Figure 9.3: Actual and predicted output series



9.5 Conclusion

This chapter analyses the role of financial factors in economic growth in Malaysia using the standard growth accounting framework. Malaysia has achieved an exceptional growth record over the last few decades. The evidence presented in this analysis shows that this is mainly due to growth in capital stocks and the labour force. Although the TFP growth has been relatively modest, there is evidence that it has become increasingly important.

In examining the impact of financial deepening on economic development via the productivity channel, a fairly robust long-run relationship is found between output, private and public capital stocks, labour force and financial deepening. The results suggest that financial deepening has a positive impact on economic growth, through both the quantitative and qualitative channels. The operation of the quantitative channel

is supported by the finding of a positive impact from private capital stocks. Relating to qualitative effects, there is evidence that an improvement in the financial system leads to higher output growth in the long-run, through raising productivity, although its impact is quite small.

CHAPTER 10: CONCLUSION

10.1 Introduction

This thesis presents a case study of the role of financial intermediation in the process of economic development in Malaysia for the period 1960-2003. The study begins with a survey of both the theoretical and empirical literature on the relationship between financial development and economic growth. The analysis in Chapter 2 highlights that most studies focus on either testing whether financial development plays a positive role in stimulating economic growth or examining the direction of causality between these two variables. Although limitations of the existing econometric techniques do not allow the issue of causality to be satisfactorily addressed, a large body of empirical evidence has overwhelmingly shown that financial development has a positive impact on economic growth. While this positive role of finance has become a stylized fact, little attention has been paid examining the mechanisms that link these two variables.

Theory suggests that financial development can lead to higher economic growth via two channels: the capital accumulation channel and the TFP channel. The capital accumulation channel, often known as the quantitative channel, is developed based on the "debt-accumulation" hypothesis which focuses on the financial sector's ability to overcome indivisibilities through the mobilization of saving. The mobilized saving is then channelled to productive sectors to fund investment projects, thereby leading to increased capital accumulation and higher output growth. The TFP channel, often known as the qualitative channel, emphasizes the role of innovative financial technologies in reducing informational asymmetries that hinder efficient allocation of financial resources and monitoring of investment projects. An efficient financial system also facilitates the adoption of expensive new technologies, thereby leading to sustained economic development. These two channels are tested separately in this thesis.

Another gap identified in the literature is that empirical studies in this subject have been dominated by cross-country studies. However, these broad comparative studies serve the limited purpose of providing a generalized picture of the relationship between financial development and economic growth. Given that the finance-growth link is largely determined by the nature and operation of financial institutions, and the policies pursued in each country, it is important to carry out comprehensive country specific studies in order to relate the findings to appropriate policy designs. Hence, this

thesis has conducted an in-depth individual country analysis using Malaysia as the case study.

Before conducting the empirical investigation, an analysis has been provided in Chapter 3 to shed some light on development in the financial and real sectors in Malaysia. The results clearly highlight that the financial system in Malaysia has deepened significantly over time alongside an increase in the level of economic development. Thus, a positive relationship between financial development and economic growth in Malaysia is observed. Data, variable construction and econometric techniques are described in Chapter 4.

10.2 Key Findings

The estimated equations in the five empirical chapters are brought together in Figure 10.1. The key inferences of the empirical results are summarized below.

Chapter 5 examines the determinants of financial deepening in Malaysia. The results show that real output positively affects the level of financial deepening, consistent with the general findings of the literature. The effect of real interest rates on financial deepening is found to be positive, providing some support for the effectiveness of interest rate liberalization as a device for deepening the financial sector. Financial repressionist policies, including interest rate controls, reserve and liquidity requirements, and directed credit programs, seem to have contributed positively to development of the Malaysian financial system. Hence, financial liberalization appears to have a separate effect on financial deepening, different from that of real interest rates.

The determinants of private saving in Malaysia are examined in Chapter 6. The analytical framework is constructed using the life cycle model with some modifications. The predictions of the life cycle hypothesis are supported by the findings of a positive impact from real income. A negative effect of age dependency on private saving is found in the short-run but not the long-run. From a policy point of view, the evidence suggests that an increase in financial deepening and real interest rates contribute positively to private saving. Compulsory saving, in the form of EPF, seems to exert a negative influence on private saving. Hence, pension saving appears to be a substitute for private saving. The Ricardian equivalence hypothesis does not seem to hold strictly in Malaysia, given that public saving only partially crowds out private saving.

The estimated results in Chapter 7 suggest that the predictions of the neoclassical model are supported by the finding of a large positive impact of aggregate output on private investment. However, user cost of capital appears to be unimportant in

private capital formation. Macroeconomic uncertainty exerts a negative influence on private investment. While there is evidence that FDI crowds in private domestic investment, public investment seems to partially crowd out private investment. More importantly, the evidence indicates that increased bank credit contributes positively to private investment, suggesting that financial development is crucial for the undertaking of investment projects in the private sector.

The results in Chapters 6 and 7 have established that savings behaviour and investment decisions are influenced by the level of financial development. The relationship between domestic saving and investment rates is tested in Chapter 8. The results show that these two variables are indeed moving closely together over time. Thus, it can be inferred that the capital accumulation channel through which financial development can impact on economic growth is present for the Malaysian experience.

Turning to testing the TFP channel, an augmented neoclassical growth model is adopted to shed some light on whether financial development leads to output expansion through raising efficiency gains in Chapter 9. The growth accounting exercise shows that TFP growth is an important driver to boost economic growth in Malaysia, suggesting that financial development may be a key contributor to economic growth through raising productivity gains. This is further supported by the regression results that financial development has an important role to play in stimulating growth by facilitating productivity growth. The results also suggest that private capital stocks and the labour force exert a positive influence on output expansion. In contrast, the accumulation of public capital stocks appears to have a negative effect on output expansion.

The key findings of this study are, by and large, consistent with the existing studies in this subject. Firstly, the results are in line with the arguments put forward by Schumpeter (1911) that financial development leads to higher economic growth by providing entrepreneurs credit for the adoption of new production techniques. The evidence is also consistent with the view of Gurley and Shaw (1960), Goldsmith (1969) and Hicks (1969) that financial development stimulates economic growth through increasing financial intermediating activities.

Figure 10.1: Summary findings of Chapters 5 to 9

Chapter 5: Financial deepening

$$\ln PC_t = -11.415^{***} + 1.582 \ln PGDP_t^{***} - 0.648 \ln FL_t^{***} + 0.054 RI_t^{***}$$

$$\ln MON_t = -7.975^{***} + 0.949 \ln PGDP_t^{***} - 0.144 \ln FL_t^{**} + 0.017 RI_t^{***}$$

Chapter 6: Private saving

$$\ln PRS_t = -6.604^{***} + 2.044 \ln PPI_t^{***} + 0.015 RI_t^{**} + 1.035 YAG_t - 1.347 OAG_t + 0.442 \ln FD_t^{***} - 0.225 \ln PEN_t^{**} - 0.125 \ln PUS_t^{***}$$

$$\ln VPRS_t = -7.804^{***} + 2.262 \ln PPI_t^{***} + 0.023 RI_t^{***} + 1.276 YAG_t - 11.8041 OAG_t + 0.403 \ln FD_t^{***} - 0.310 \ln PEN_t^{**} - 0.180 \ln PUS_t^{***}$$

Chapter 7: Private investment

$$\ln PRI_t = -13.640^{***} + 2.284 \ln GDP_t^{***} + 0.862 COC_t + 2.128 BC_t^{***} - 0.035 UNC_t^{***} - 0.388 \ln PUB_t^{*} - 0.535 D_{69}^{**}$$

$$\ln PDI_t = -12.662^{***} + 2.063 \ln GDP_t^{***} + 0.354 COC_t + 2.355 BC_t^{***} - 0.037 UNC_t^{***} - 0.210 \ln PUB_t^{*} - 0.667 D_{69}^{***}$$

$$\ln PDI_t = -10.115^{***} + 1.837 \ln GDP_t^{***} + 0.301 COC_t + 1.973 BC_t^{***} - 0.025 UNC_t^{***} - 0.204 \ln PUB_t^{**} + 0.109 \ln FDI_t^{**} - 0.533 D_{69}^{***}$$

Chapter 8: Investment and saving rate

$$\ln(I/Y)_t = 0.133 + 1.205 \ln(S/Y)_t^{***} - 0.477 D_{98-03}^{***}$$

Chapter 9: Aggregate output

$$\ln GDP_t = 7.629^{***} + 0.378 \ln PRK_t^{***} - 0.322 \ln PUK_t^{***} + 1.674 \ln LF_t^{***} + 0.096 \ln PC_t^{***} - 0.097 D_{85-86}^{***}$$

$$\ln GDP_t = 7.791^{***} + 0.388 \ln PRK_t^{***} - 0.281 \ln PUK_t^{***} + 1.329 \ln LF_t^{***} + 0.334 \ln MON_t^{***} - 0.060 D_{85-86}^{**}$$

where

BC_t	=	real bank credit flow to the private sector
COC_t	=	real user cost of capital
D_{69}	=	dummy variable for the racial riots
$D_{85\text{-}86}$	=	dummy variable for the global economic recession
$D_{97\text{-}98}$	=	dummy variable for the Asian financial crisis
$D_{98\text{-}03}$	=	dummy variable for the capital control regime
FD_t	=	financial deepening (private credit/private income)
FDI_t	=	real foreign direct investment
FL_t	=	financial liberalization
GDP_t	=	real output
LF_t	=	labour force
MON_t	=	financial deepening (M2/GDP)
OAG_t	=	old age dependency

PC_t	=	financial deepening (private credit/GDP)
PDI_t	=	real private domestic investment
PEN_t	=	expected pension (EPF) benefits
$PGDP_t$	=	per capita real GDP
PPI_t	=	per capita real private income
PRI_t	=	real private investment
PRK_t	=	real private capital stocks
PRS_t	=	real private saving
PUB_t	=	real public investment
PUK_t	=	real public capital stocks
PUS_t	=	real public saving
RI_t	=	real interest rates
UNC_t	=	macroeconomic uncertainty
$VPRS_t$	=	real voluntary private saving
YAG_t	=	young age dependency
$(I/Y)_t$	=	gross domestic investment rate
$(S/Y)_t$	=	gross domestic saving rate

*Notes: *, ** and *** indicate 10%, 5% and 1% level of significance, respectively.*

Secondly, the results also lend some support to Robinson's (1952) view that economic development leads to an improvement in the financial system. These two points suggest that financial development and economic growth in Malaysia show a bi-directional causality pattern, providing some support for the argument of using a system, rather than a single equation, approach to examining the relationship between financial development and economic growth. The results also support the endogenous finance and growth theories which postulate a feedback relationship in the finance-growth nexus.

Thirdly, the results provide only some qualified support for the McKinnon-Shaw financial liberalization thesis. On the one hand, real interest rates have a positive impact on development of the financial system, suggesting that the elimination of interest rate controls may promote financial development. On the other hand, when considering the joint influence of all financial sector policies (including interest rate controls, reserve and liquidity requirements, and directed credit programs), financial liberalization appears to have a negative effect on financial development. Hence, the improvement in the Malaysian financial sector does not seem to have been retarded by the repressionist policies imposed on the financial system. It is argued that this may be due to the presence of a sound institutional framework, which has enabled the repressionist policies to be carried out effectively, thereby exerting a favourable effect on the financial system.

Fourthly, Malaysia's saving rate has been very high. This high saving record is partly due to the presence of a forced saving scheme in the form of a broad based EPF, which constitutes a significant proportion of the total saving. Such a forced saving scheme involves the shifting of a large amount of funds from the private sector to the

public sector. Given that the public sector is less efficient, this implies that EPF saving may have an adverse impact on economic growth.

Fifthly, it appears that public sector investment is not complementary to private sector investment. Instead, public investment is found to have some crowding out effects on private investment. Related to this, the results in Chapter 9 suggest that public sector capital formation, unlike private sector capital accumulation, is negatively related to long-term growth in the Malaysian economy. This may be partly due to the weeping affirmative action policy (i.e., the New Economic Policy) introduced in 1970, which has led to resources being allocated to the less efficient sectors that do not generate the most productive gains.

Finally, the dummy variable used to capture the effect the Asian financial crisis is found to be statistically insignificant in all estimated equations. This suggests that Asian financial crisis has no impact on financial development, the saving and investment decision making process in the private sector, as well as the production of aggregate output.

10.3 Policy Implications and Directions for Future Research

A key policy implication that emerges from the results is that it is critical for the government to develop the financial sector since financial deepening facilitates mobilization of saving, private capital formation, and long-term economic growth. A sound financial system instils confidence among savers so that resources can be effectively mobilized to increase productivity in the economy. To this end, a credible and reliable support system is indispensable to ensure the smooth-functioning of the financial system. The results also highlight that the financial constraints imposed on the Malaysian financial system seem to have helped deepening the financial system. Since the success of financial sector policies may depend on the effectiveness of the institutions that implement them, it is critical to ensure that sound institutional quality is always in place.

The findings in this case study clearly points to the danger involved in generalizing results from multi-country cross sectional studies. For instance, as opposed to the existing literature, public investment in Malaysia is found to have a crowding out effect, rather than a complementary role, in the capital formation of the private sector. Furthermore, accumulation of public capital stocks appears to be harmful for long-term growth in Malaysia. Thus, there is certainly a need for more country-specific research using appropriate econometric techniques, insight of institution, and the economic

histories of each country to address the key issues in financial development in order to inform appropriate analytical as well as policy debate. Although the findings of this analysis may be unique to Malaysia, due to its specific institutional and structural characteristics, the analytical framework employed in this study can be readily extended to include other less developed countries.

There are several avenues where future research can be directed. The negative effect of public sector capital formation on economic growth appears to be an interesting topic for further study. The results presented in Chapter 9 have only highlighted some plausible causes of these results. A detailed analysis is required to shed more light on this finding. Another useful area for further research would be to examine how the operation of the Employee Provident Fund (EPF) impacts on the Malaysian economy. How the accumulated contributions are invested and their national gains or losses may be of significant interest to researchers and policy makers. Furthermore, the analysis carried out in this study is at the macro level. Undertaking an in-depth micro level analysis is desirable to supplement the findings of this study. This thesis has focused on polices relating to the domestic financial sector liberalization. The impact of capital account opening on domestic saving, investment and growth is an interesting topic that requires more research. Finally, as highlighted in the thesis, Islamic banking has become increasingly important in the Malaysian financial system. Its modalities, operation, development and their implications on the Malaysian economy is another possible candidate for future research.

Appendix 1: Key events in the financial sector of Malaysia, 1959 – 2003

Date	Events
1959	The Bank Negara Malaysia (BNM), i.e., the Central Bank of Malaysia, was established.
1960	Stock trading started in Kuala Lumpur.
1963	Discount houses were established to facilitate money market and inter-bank activities.
1965	Liquid assets requirements for banks were amended so that only Malaysian assets are eligible.
1967	The authority to issue currency was transferred from the currency board system to BNM.
1970	Merchant banks were set up.
1971	Commercial banks were allowed to issue fixed deposits up to 36 months.
	Foreign banks were prohibited from opening new branches.
	The second discount house (Malaysian Discount Berhad) was set up.
1972	Commercial banks were allowed to issue fixed deposits up to 60 months.
	Credit Guarantee Corporation of Malaysia (CGCM) was set up to facilitate more lending to *bumiputra* economic activities.
1973	Most restrictions on the exchange rate were uplifted and thus the exchange rate was no longer fixed.
	Currency convertibility with Brunei and Singapore ended.

Date	Events
	The last license to a foreign banking institution was granted.
	The combined stock exchange market for Malaysia and Singapore was reconstituted as the Kuala Lumpur Stock Exchange (KLSE) and the Stock Exchange of Singapore (SES), respectively. Listed companies could continue to be traded in both exchange markets if they wish.
1975	Directed credit programs were implemented. Banks were required to meet minimum lending to certain priority sectors, of which the *bumiputra* community was the main target.
1978	The exchange rate was pegged to a trade weighted basket of currencies based on the major trading partners.
	For the first time, commercial banks were allowed to freely determine the deposit and lending rates. Prior to this, the interest rates were controlled.
1979	Industrial Bank of Malaysia was formed to finance loans which exceed seven years.
	Negotiable Certificates of Deposit (NCDs) and Bankers' Acceptances (BA) markets were established.
1983	Bank Islam Malaysia Berhad (BIMB) was established as the first Islamic bank under the legislation of the Islamic Banking Act 1983.
	The base lending rate (BLR) regime was introduced in November, where all banks were required to peg their lending rates to the BLR.
1985	An economic recession took place in Malaysia. Interest rate controls were reintroduced (but later removed in 1991).
	CAGAMAS bonds were introduced to finance the housing credit market.
1985-86	Monetary control was eased in response to economic recession in order to stimulate investment.
1986	Greater ownership by foreign companies was granted.
	Several cooperative finance companies and banks failed, and they were bailed out by the central bank. Laws were passed to bring them under closer supervision by BNM.
1987	New measures were implemented to further liberalize the exchange rate.

Date	Events
	Large merchant banks were authorized to issue Negotiable Certificates of Deposit (NCDs).
	BNM turned to the use of the BLR to control interest rates (abandoned later in 1991).
1988	The supervision of the insurance industry was brought under the purview of BNM, with the aim of streamlining the supervision of the entire financial system and realizing economies of scale in supervision.
1988-91	BNM implemented 12 upward revisions of statutory ratios to curb excessive lending to the private sector.
1989	The double listing of securities in both Malaysia and Singapore ceased following the split of the Stock Exchange of Singapore (SES) from the Kuala Lumpur Stock Exchange (KLSE). The "over-the-counter" market, Central Limit Order Book (CLOB), was established.
	The Banking and Financial Institutions Act placed all banking institutions under the supervision BNM, aimed at strengthening prudential regulation.
	A computerized inter-bank funds transfer system was introduced.
1989-92	Money market operation ceased.
1990	Capital market reforms were initiated through easing the entry barriers to broking activities, increasing the number of mutual funds, and raising the limit of foreign share-ownership to 49%.
	The International Offshore Financial Centre was set up in Labuan.
	A credit rating agency, i.e., the Rating Agency of Malaysia Berhad (RAM), was established.
1991	The central bank abandoned the use of the BLR as a mechanism to control the interest rates.
1991-92	Excess funds of the EPF were transferred to BNM.
1993	Swaps transactions were limited to only US$2 million per day per customer. An upper limit of US$5 million on all non-traded foreign exchange transactions was set.
	A two-tier regulatory system was initiated to improve efficiency of the banking sector. By the end of 1997, 18 banking institutions were qualified and granted incentives.

Date	Events
1994	The managed float exchange system was abolished.
	Some temporary capital controls were imposed in January and February.
	Foreign currency accounts were permitted in selected domestic banks.
1997	The Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ) was established as an avenue for small, high-growth potential and high-technology companies to raise funds.
	There were massive capital outflows, coupled with rapid decline in equity and real estate values.
	Ringgit depreciated sharply. BNM intervened aggressively to defend the Ringgit. The managed float was abandoned in July.
	The KLSE banned short selling of stocks in August, but the ban was lifted one week later.
1997-98	Inter-bank interest rates were raised from 7.5% in August 1997 to 11% in February 1998 to prevent Ringgit from falling.
1998	A guarantee for bank depositors by BNM was introduced in January.
	The required reserve ratios were cut from 13.5% to 10% in February, and further to 4% in September to increase liquidity in the financial system.
	Mergers and acquisitions among troubled banking institutions were announced in February.
	Two agencies, i.e., *Danaharta* and *Danamodal*, were created, which were responsible for purchasing non-performing loans at a discount and injecting new capital in selected institutions, respectively.
	The Corporate Debt Restructuring Committee (CDRC) was set up to help large borrowers resolving non-performing loans.
	BNM reduced the default period for the classification of non-performing loans from 6 months to 3 months, with the objective of improving prudential supervision.
	Overseas trading of Malaysian stocks was banned. The trading of CLOB was discontinued from September.

Date	Events
	In September, a wide range of currency and capital controls were introduced. A fixed exchange rate of RM 3.80 per US$ was implemented, effective from October (this was abandoned in 2005).
1999	Banking institutions were required to achieve a minimum loan growth of 8% by the end of 1999.
	The authorities announced the end of recession, as GDP had grown by 4.1%, on a year-on-year basis.
2000	Several schemes to promote and enhance the regulatory structure of the bond market were introduced.
	A set of minimum guidelines on the provision of internet banking services was laid out.
	In December, profits earned from foreign investment were exempted from levy.
2001	The 10-year Capital Market Master Plan (CMP), with the objectives of improving efficiency and competitiveness of capital markets, was published in February.
	The 10-year Financial Sector Master Plan (FSMP), which aimed at transforming the financial sector into a more resilient and competitive system, was launched in March.
	A few changes were introduced to the Revision of Corporate Debt Restructuring Committee (CDRC) framework to facilitate and expedite the restructuring efforts.
	The Anti-Money Laundering Act 2001 (AMLA) was enacted in July, signifying a concerted effort to combat illegal transfer of financial resources as a means to legitimize such assets.
2002	In order to facilitate the restructuring of troubled companies, the relaxation of several conditions for the injection of foreign assets and multinational companies (MNCs) into the local listed companies was announced in May.
	A deposit insurance system was introduced to further strengthen the consumer protection framework. It provides an explicit guarantee on insured deposits up to a specified amount in the event that a deposit-taking institution fails to meet its obligations to depositors.
	The Islamic Financial Services Board (IFSB) was launched in November with the key objective of establishing standards for regulation of the Islamic financial services industry based on the *Shariah* principles for voluntary adoption by member countries.
2003	The first variable rate financing was developed for the Islamic banking industry under the concept of "deferred payment sale" to alleviate the mismatching of risks.
	The Securities Commission liberalized rules on the use of proceeds from private debt securities (PDS) to allow these funds to be used to fund the development of hypermarkets, which were previously prohibited.

Date	Events
	A set of new guidelines was issued in March to liberalize the KLSE listing policies. Large companies were exempted from the three to five profits record requirement. Malaysian business abroad and foreign entities with Malaysian operations were allowed to list on the KLSE.
	A Special Relief Guarantee Facility was set up in May to assist Severe Acute Respiratory Syndrome (SARs) affected businesses.
	The International Centre for Leadership in Finance (ICLIF) was launched in October, with the key objective of developing world class leaderships in the finance and business sectors in Malaysia and the region.

Sources: BNM's Money and Banking in Malaysia (1989), Emery (1991), Yusof, Hussin, Alowi, Lim and Singh (1994), Dekle and Pradhan (1997), Williamson and Mahar (1998), Ariff and Khalid (2000), Athukorala (2001), Goh, Alias and Olekalns (2003), Detragiache and Gupta (2004) and BNM's Annual Report (various issues).

Appendix 2: Data sources and the original data series

Mnemonics	Definition	Sources
BCP	Domestic credit to the private sector	IFS
CAL	Commercial banks average lending rate	M&B (1994), MSB
CLR	Commercial banks liquidity ratio	M&B (1994), MSB
CPI	Consumer price index	M&B (1994), MSB
CTR	Company tax rate	MOF
DIR	12-month fixed deposit interest rate	M&B (1994), MSB
EPF	Employee provident fund contributions	M&B (1994), MSB
FDI	Foreign direct investment	M&B (1994), MSB
GCF	Gross capital formation	M&B (1994), MSB, WDI
GDP	Gross domestic product	ER, WDI
GNP	Gross national product	M&B (1994), MSB
GNS	Gross national saving	M&B (1994), MSB
GPRI	Gross private fixed capital formation	M&B (1994), MSB
GPUB	Gross public fixed capital formation	M&B (1994), MSB
LF	Labour force	WDI
M2	Broad money supply M2	M&B (1994), MSB
MAD	Maximum deposit rate	AR, M&B (1994)
MAL	Maximum lending rate	AR, M&B (1994)
MID	Minimum deposit rate	AR, M&B (1994)
MIL	Minimum lending rate	AR, M&B (1994)
OAG	Old age dependency	WDI
PIR	Policy intervention rate	AR
PSL	Priority sector (*bumiputra* community) target rate	AR
PSR	Maximum lending rate for priority sectors	AR, M&B (1994)
PUC	Public consumption	M&B (1994), MSB
PUS	Public saving	AR, ER
SRR	Commercial banks statutory reserve requirements	AR, M&B (1994)
YAG	Young age dependency	WDI

Notes: AR = Annual Reports of BNM, ER = Economic Reports of the Ministry of Finance Malaysia, IFS = International Financial Statistics (2005) of the International Monetary Fund, MOF = Ministry of Finance Malaysia, MSB = Monthly Statistical Bulletin of BNM, M&B = Money and Banking in Malaysia (1989, 1994) of BNM, and WDI = World Development Indicators (2005) of The World Bank.

Year	BCP (RM million)	CAL (%)	CLR (%)	CPI (1987 = 100)	CTR (%)	DIR (%)	EPF (RM Million)	FDI (RM million)
1960	474	6.00	20	40.58	40	4.00	85	63
1961	618	7.50	20	40.50	40	5.00	91	180
1962	686	6.88	25	40.54	40	4.00	94	235
1963	919	6.88	25	41.80	40	4.00	106	270
1964	916	7.21	25	41.64	40	5.00	115	165
1965	1,119	7.67	20	41.60	40	5.00	126	150
1966	1,270	7.25	20	42.17	40	5.00	138	170
1967	1,405	7.75	20	43.92	40	6.00	148	130
1968	1,690	7.75	20	43.83	40	6.00	153	93
1969	2,061	7.75	20	43.65	40	6.00	160	245
1970	2,518	7.75	20	44.49	40	6.00	207	287
1971	2,923	7.75	20	45.19	40	6.00	246	306
1972	3,447	7.75	20	46.65	40	5.75	284	320
1973	5,203	8.08	25	51.57	40	8.00	292	420
1974	6,454	9.50	25	60.51	40	9.00	303	1,374
1975	7,663	8.75	25	63.23	40	7.50	378	839
1976	9,544	8.75	25	64.89	40	7.50	509	969
1977	11,585	7.25	25	68.00	40	6.50	567	999
1978	14,849	7.25	25	71.30	40	6.50	705	1,158
1979	19,256	7.25	20	73.91	40	7.00	832	1,255
1980	26,606	7.75	20	78.84	40	9.00	1,068	2,033
1981	33,278	7.75	20	86.49	40	11.00	1,807	2,914
1982	29,197	12.00	20	91.52	40	10.00	2,058	3,263
1983	49,259	10.75	20	94.91	40	9.00	2,313	2,926
1984	59,575	12.25	20	98.61	40	10.75	2,510	1,869
1985	68,309	10.75	17	98.96	40	7.50	2,730	1,725
1986	72,644	10.00	17	99.68	40	7.00	2,950	1,262
1987	72,633	7.50	17	100.00	40	4.25	3,098	1,065
1988	79,865	7.00	17	102.53	40	4.25	3,205	1,884
1989	68,219	7.00	17	105.41	35	5.50	3,566	4,518
1990	82,657	7.50	17	108.65	35	7.25	4,139	6,309
1991	99,668	9.00	17	113.35	35	3.25	4,921	10,996
1992	163,124	9.29	17	118.75	35	7.84	6,317	13,204
1993	182,022	8.22	17	122.98	34	6.29	7,376	12,885
1994	212,876	6.83	17	127.52	32	6.15	8,800	10,798
1995	276,222	8.03	17	131.92	30	6.89	10,324	10,464
1996	351,100	9.18	17	136.52	30	7.26	12,383	12,777
1997	436,479	10.33	17	140.16	30	9.33	14,515	14,450
1998	432,937	8.04	15	147.55	28	5.74	16,499	8,490
1999	426,082	6.79	4	151.60	28	3.95	18,405	14,802
2000	451,665	6.78	4	153.94	28	4.24	20,954	14,393
2001	471,670	6.39	4	156.13	28	4.00	20,535	2,105
2002	501,930	6.39	4	158.95	28	4.00	21,432	12,173
2003	531,811	6.00	4	160.68	28	3.70	22,532	9,398

Year	GCF (constant 1987 RM million)	GCF (RM million)	GDP (constant 1987 RM million)	GDP (RM million)	GNP (RM million)	GNS (RM million)	GPRI (RM million)	GPUB (RM million)
1960	2,048	875	14,887	7,473	5,843	1,204	615	140
1961	2,553	1,157	16,018	7,417	6,681	1,141	681	476
1962	3,003	1,389	17,046	7,787	7,047	1,222	747	642
1963	3,227	1,462	18,297	8,291	7,513	1,243	789	673
1964	3,290	1,536	19,278	8,877	7,960	1,408	859	677
1965	3,634	1,664	20,759	9,759	8,776	1,786	922	742
1966	3,802	1,742	22,382	10,386	9,344	1,782	1,002	740
1967	3,491	1,599	23,245	10,763	9,647	1,581	885	622
1968	3,647	1,669	25,100	11,226	10,074	1,764	921	625
1969	3,330	1,525	26,327	12,400	10,939	2,256	893	620
1970	4,505	2,071	27,903	13,092	11,644	2,096	1,197	693
1971	5,619	2,688	29,508	13,779	12,592	2,359	1,890	811
1972	6,080	3,061	32,277	15,125	13,842	2,363	2,049	1,162
1973	7,736	4,426	36,057	19,915	18,064	4,672	2,984	1,235
1974	10,228	6,512	39,054	24,314	21,861	5,205	4,154	1,644
1975	7,974	5,221	39,367	23,753	21,606	4,034	3,492	2,110
1976	8,909	6,135	43,919	29,873	26,988	7,609	3,701	2,505
1977	10,723	7,586	47,326	34,397	31,064	8,786	4,265	3,078
1978	13,304	10,104	50,474	38,581	36,186	10,353	6,021	3,360
1979	15,083	13,423	55,193	47,275	44,354	15,456	8,115	4,135
1980	17,923	16,217	59,301	54,285	51,390	15,597	10,394	6,203
1981	21,004	20,157	63,418	58,669	55,602	14,524	11,466	9,293
1982	24,023	23,338	67,186	63,726	59,690	14,929	11,367	11,378
1983	25,858	26,466	71,385	71,223	65,530	18,349	12,682	12,531
1984	27,273	26,697	76,926	81,009	74,182	22,780	13,345	12,046
1985	21,892	21,367	76,062	78,890	72,039	19,645	12,270	10,854
1986	18,948	18,604	76,939	72,907	66,814	18,288	10,266	8,599
1987	18,716	18,716	81,085	81,085	74,679	25,097	10,838	7,442
1988	23,868	24,350	89,143	92,370	85,777	28,323	12,764	8,846
1989	27,819	31,434	97,218	105,233	96,684	29,992	19,151	11,097
1990	31,821	38,535	105,977	119,081	110,764	33,954	25,088	13,283
1991	41,208	51,064	116,093	135,123	128,324	36,372	34,280	14,749
1992	42,616	53,285	126,408	150,682	142,676	46,482	36,823	21,541
1993	52,322	67,472	138,916	172,193	163,928	54,534	44,096	24,101
1994	58,944	80,534	151,713	195,460	186,049	62,133	51,701	24,657
1995	74,139	97,087	166,625	222,472	212,095	73,324	66,642	27,543
1996	78,425	105,246	183,292	253,733	241,931	91,517	79,388	28,437
1997	87,236	121,096	196,714	281,795	266,793	104,400	89,671	31,823
1998	49,685	75,555	182,237	283,243	269,138	112,871	44,029	31,953
1999	47,767	67,317	193,422	300,764	279,452	114,785	31,375	35,108
2000	62,013	93,711	210,557	343,215	314,306	125,964	44,102	43,627
2001	55,860	80,006	211,227	334,404	308,781	107,697	34,528	48,817
2002	59,327	85,981	219,988	361,624	336,563	116,475	29,376	54,388
2003	57,013	84,247	231,674	394,200	371,673	135,092	29,856	57,233

Year	LF (million)	M2 (RM million)	MAD (1 = yes, 0 = no)	MAL (1 = yes, 0 = no)	MID (1 = yes, 0 = no)	MIL (1 = yes, 0 = no)	OAG
1960	2.814	1,649	1	0	1	1	0.07
1961	2.909	1,759	1	0	1	1	0.07
1962	3.002	1,863	1	0	1	1	0.07
1963	3.094	2,044	1	0	1	1	0.06
1964	3.186	2,211	1	0	1	1	0.06
1965	3.278	2,445	1	0	1	1	0.06
1966	3.369	2,730	1	0	0	1	0.06
1967	3.460	2,818	1	0	0	1	0.06
1968	3.552	3,258	1	0	0	1	0.06
1969	3.643	3,719	1	0	0	1	0.07
1970	3.736	4,122	1	0	0	1	0.07
1971	3.875	4,668	1	0	0	1	0.07
1972	4.019	5,762	1	0	0	1	0.07
1973	4.166	7,552	0	0	0	1	0.07
1974	4.315	8,714	0	0	0	1	0.07
1975	4.467	9,982	0	0	0	1	0.07
1976	4.623	12,748	0	0	0	1	0.07
1977	4.782	14,819	0	0	0	1	0.07
1978	4.947	17,467	0	0	0	0	0.07
1979	5.117	21,616	0	0	0	0	0.06
1980	5.295	27,992	0	0	0	0	0.06
1981	5.457	32,773	0	0	0	0	0.06
1982	5.628	37,900	0	0	0	0	0.06
1983	5.809	42,264	0	1	0	1	0.06
1984	6.000	47,733	0	1	0	1	0.06
1985	6.203	50,412	1	1	1	1	0.06
1986	6.422	56,097	1	1	1	1	0.06
1987	6.654	59,772	0	1	0	1	0.06
1988	6.896	64,072	0	1	0	1	0.06
1989	7.146	74,393	0	1	0	1	0.06
1990	7.401	83,903	0	1	0	1	0.06
1991	7.608	96,093	0	0	0	0	0.06
1992	7.822	114,481	0	0	0	0	0.06
1993	8.042	139,800	0	0	0	0	0.06
1994	8.269	160,366	0	0	0	0	0.06
1995	8.502	198,873	0	0	0	0	0.06
1996	8.767	238,209	0	0	0	0	0.06
1997	9.042	292,217	0	0	0	0	0.07
1998	9.309	296,472	0	0	0	0	0.07
1999	9.586	337,138	0	0	0	0	0.07
2000	9.878	354,702	0	0	0	0	0.07
2001	10.176	362,512	0	0	0	0	0.07
2002	10.464	383,542	0	0	0	0	0.07
2003	10.741	426,061	0	0	0	0	0.07

Year	PIR (1 = yes, 0 = no)	PSL (%)	PSR (1 = yes, 0 = no)	PUC (RM million)	PUS (RM million)	SRR (%)	YAG
1960	0	0	0	791	344	4	0.88
1961	0	0	0	959	319	4	0.89
1962	0	0	0	1027	288	4	0.89
1963	0	0	0	1190	210	4	0.90
1964	0	0	0	1378	181	4	0.91
1965	0	0	0	1535	177	3.5	0.91
1966	0	0	0	1740	214	3.5	0.90
1967	0	0	0	1704	254	3.5	0.89
1968	0	0	0	1744	346	3.5	0.88
1969	0	0	0	1826	452	5	0.87
1970	0	0	0	2162	527	5	0.86
1971	0	0	0	2170	344	5	0.84
1972	0	0	0	2738	80	8.5	0.82
1973	0	0	0	2934	438	8.5	0.81
1974	0	0	0	3516	904	10	0.79
1975	0	50	0	3924	471	8.5	0.78
1976	0	20	1	4301	1,273	6	0.76
1977	0	0	1	5388	1,134	6	0.74
1978	0	20	1	6090	1,717	5	0.72
1979	0	17	1	6475	2,174	5	0.71
1980	0	17	1	8811	1,599	5	0.69
1981	0	17	1	10425	1,302	5	0.69
1982	0	18	1	11469	1,926	5	0.68
1983	0	18	1	11015	5,972	5	0.68
1984	0	20	1	11741	7,174	5	0.68
1985	0	20	1	11844	9,802	4	0.67
1986	0	20	1	12127	4,487	3.5	0.66
1987	0	20	1	12239	4,854	3.5	0.65
1988	0	20	1	12997	7,331	3.5	0.63
1989	0	20	1	14769	10,785	5.5	0.62
1990	0	20	1	16426	14,850	6.5	0.61
1991	0	20	1	18504	16,665	7.5	0.61
1992	0	20	1	19604	24,390	8.5	0.61
1993	0	20	1	21750	27,339	8.5	0.60
1994	0	20	1	23,973	33,343	11.5	0.60
1995	0	20	1	27,527	32,765	11.5	0.60
1996	0	30	1	28,178	39,761	13.5	0.59
1997	1	30	1	30,341	56,435	13.5	0.58
1998	1	30	1	27,670	41,791	4	0.57
1999	1	30	1	33,467	50,694	4	0.56
2000	1	30	1	35,676	55,391	4	0.55
2001	1	30	1	42,265	53,534	4	0.54
2002	1	30	1	50,015	63,496	4	0.53
2003	1	30	1	54,913	66,313	4	0.53

Appendix 3: Data used in the regression analysis of financial deepening

Year	$\ln PC_t$	$\ln MON_t$	$\ln PGDP_t$	RI_t	$\ln FL_t$
1960	-2.758	-1.511	7.520		4.605
1961	-2.485	-1.439	7.560	5.200	4.605
1962	-2.429	-1.430	7.590	3.900	4.433
1963	-2.200	-1.400	7.630	0.900	4.433
1964	-2.271	-1.390	7.650	5.400	4.433
1965	-2.166	-1.384	7.700	5.100	4.622
1966	-2.101	-1.336	7.740	3.600	4.663
1967	-2.036	-1.340	7.750	1.900	4.663
1968	-1.894	-1.237	7.790	6.200	4.663
1969	-1.795	-1.204	7.820	6.400	4.610
1970	-1.649	-1.156	7.850	4.100	4.610
1971	-1.551	-1.082	7.920	4.400	4.610
1972	-1.479	-0.965	7.990	2.500	4.497
1973	-1.342	-0.970	8.070	-2.600	4.366
1974	-1.326	-1.026	8.120	-8.300	4.326
1975	-1.131	-0.867	8.110	3.000	3.518
1976	-1.141	-0.852	8.190	4.900	3.962
1977	-1.088	-0.842	8.240	1.700	4.402
1978	-0.955	-0.792	8.280	1.600	4.003
1979	-0.898	-0.783	8.320	3.300	4.175
1980	-0.713	-0.662	8.370	2.300	4.175
1981	-0.567	-0.582	8.410	1.300	4.175
1982	-0.781	-0.520	8.440	4.200	4.153
1983	-0.369	-0.522	8.480	5.300	4.102
1984	-0.307	-0.529	8.520	6.900	4.062
1985	-0.144	-0.448	8.490	7.200	4.107
1986	-0.004	-0.262	8.470	6.300	4.118
1987	-0.110	-0.305	8.500	3.900	4.162
1988	-0.145	-0.366	8.570	1.700	4.162
1989	-0.433	-0.347	8.630	2.700	4.119
1990	-0.365	-0.350	8.690	4.200	4.098
1991	-0.304	-0.341	8.760	-1.100	4.128
1992	0.079	-0.275	8.820	3.100	4.107
1993	0.056	-0.208	8.870	2.700	4.107
1994	0.085	-0.198	8.930	2.500	4.047
1995	0.216	-0.112	8.990	3.400	4.047
1996	0.325	-0.063	9.070	3.800	3.838
1997	0.438	0.036	9.110	6.700	3.801
1998	0.424	0.046	9.010	0.500	3.997
1999	0.348	0.114	9.050	1.200	4.252
2000	0.275	0.033	9.100	2.700	4.252
2001	0.344	0.081	9.080	2.600	4.252
2002	0.328	0.059	9.100	2.200	4.252
2003	0.299	0.078	9.130	2.600	4.252

Appendix 4: Data used in the regression analysis of private saving

Year	$\ln PRS_t$	$\ln VPRS_t$	$\ln PPI_t$	YAG_t	OAG_t	RI_t	$\ln FD_t$	$\ln PEN_t$	$\ln PUS_t$
1960	7.446	7.342	7.053	0.882	0.067		-2.296	-2.070	6.530
1961	7.482	7.365	7.240	0.888	0.066	5.200	-2.168	-2.053	6.535
1962	7.623	7.516	7.280	0.894	0.065	3.900	-2.123	-1.970	6.446
1963	7.732	7.624	7.322	0.900	0.065	0.891	-1.895	-1.887	6.139
1964	7.888	7.790	7.325	0.905	0.064	5.389	-1.944	-1.794	5.974
1965	8.138	8.056	7.375	0.911	0.064	5.098	-1.843	-1.756	5.931
1966	8.125	8.034	7.401	0.900	0.064	3.631	-1.761	-1.671	6.134
1967	7.961	7.842	7.412	0.890	0.065	1.853	-1.700	-1.586	6.307
1968	8.062	7.948	7.453	0.879	0.065	6.200	-1.553	-1.522	6.651
1969	8.251	8.158	7.459	0.868	0.065	6.401	-1.436	-1.508	6.867
1970	8.115	7.974	7.470	0.858	0.066	4.089	-1.269	-1.427	7.024
1971	8.370	8.240	7.608	0.841	0.066	4.432	-1.238	-1.412	6.602
1972	8.491	8.358	7.669	0.825	0.067	2.518	-1.163	-1.362	5.140
1973	8.945	8.873	7.766	0.808	0.067	-2.563	-1.038	-1.526	6.676
1974	8.840	8.767	7.792	0.792	0.068	-8.327	-0.994	-1.576	7.281
1975	8.684	8.571	7.785	0.777	0.069	3.013	-0.809	-1.433	6.660
1976	9.139	9.056	7.858	0.758	0.068	4.866	-0.808	-1.502	7.535
1977	9.262	9.185	7.902	0.741	0.067	1.711	-0.751	-1.482	7.353
1978	9.332	9.247	7.971	0.724	0.066	1.639	-0.648	-1.470	7.717
1979	9.649	9.584	8.040	0.707	0.065	3.347	-0.617	-1.541	7.839
1980	9.635	9.556	8.087	0.690	0.064	2.325	-0.432	-1.502	7.466
1981	9.567	9.420	8.119	0.686	0.064	1.300	-0.276	-1.342	7.249
1982	9.526	9.354	8.121	0.683	0.064	4.180	-0.461	-1.192	7.616
1983	9.426	9.219	8.092	0.679	0.064	5.295	0.015	-1.048	8.697
1984	9.604	9.428	8.142	0.675	0.065	6.851	0.075	-1.000	8.827
1985	9.158	8.833	8.039	0.672	0.065	7.154	0.304	-0.743	9.154
1986	9.586	9.346	8.098	0.659	0.064	6.263	0.370	-0.598	8.463
1987	9.916	9.749	8.156	0.647	0.064	3.934	0.232	-0.603	8.488
1988	9.916	9.751	8.224	0.634	0.063	1.721	0.199	-0.607	8.864
1989	9.784	9.578	8.239	0.622	0.063	2.686	-0.042	-0.563	9.207
1990	9.741	9.497	8.290	0.610	0.062	4.184	0.039	-0.543	9.489
1991	9.737	9.450	8.390	0.608	0.062	-1.084	0.068	-0.567	9.569
1992	9.827	9.491	8.401	0.605	0.063	3.077	0.503	-0.470	9.926
1993	9.996	9.680	8.463	0.603	0.063	2.728	0.461	-0.468	10.001
1994	10.014	9.650	8.511	0.600	0.064	2.460	0.503	-0.427	10.161
1995	10.321	10.028	8.612	0.598	0.064	3.439	0.599	-0.442	10.108
1996	10.529	10.256	8.689	0.588	0.065	3.771	0.702	-0.421	10.265
1997	10.419	10.058	8.666	0.578	0.065	6.667	0.886	-0.319	10.581
1998	10.731	10.466	8.664	0.568	0.066	0.470	0.774	-0.314	10.199
1999	10.627	10.288	8.618	0.559	0.066	1.205	0.780	-0.219	10.392
2000	10.676	10.324	8.671	0.549	0.066	2.691	0.705	-0.287	10.434
2001	10.440	9.964	8.631	0.542	0.068	2.583	0.795	-0.252	10.429
2002	10.381	9.862	8.618	0.535	0.069	2.192	0.811	-0.246	10.562
2003	10.607	10.210	8.679	0.528	0.071	2.610	0.753	-0.302	10.571

Appendix 5: Data used in the regression analysis of private investment

Year	$\ln PRI_t$	$\ln FDI_t$	$\ln PDI_t$	$\ln PUB_t$	$\ln GDP_t$	COC_t	BC_t	UNC_t
1960	7.272	-0.860	7.164	5.792	9.608			
1961	7.315	0.117	7.008	6.957	9.681	0.153	0.346	0.046
1962	7.387	0.321	7.009	7.236	9.744	0.102	0.118	0.060
1963	7.463	0.389	7.044	7.304	9.815	0.096	0.301	0.077
1964	7.518	-0.156	7.304	7.279	9.867	0.082	-0.019	0.076
1965	7.608	-0.325	7.430	7.391	9.941	0.081	0.179	0.069
1966	7.690	-0.275	7.504	7.387	10.016	0.103	0.140	0.048
1967	7.566	-0.581	7.407	7.214	10.054	0.099	0.103	0.066
1968	7.607	-0.993	7.501	7.220	10.131	0.123	0.219	0.070
1969	7.576	-0.072	7.255	7.211	10.178	0.057	0.147	0.072
1970	7.865	0.028	7.591	7.318	10.236	0.101	0.204	0.069
1971	8.282	0.036	8.105	7.436	10.292	0.105	0.154	0.170
1972	8.311	-0.009	8.142	7.744	10.382	0.104	0.161	0.203
1973	8.559	0.153	8.408	7.677	10.493	-0.046	0.247	0.197
1974	8.783	1.258	8.382	7.856	10.573	0.019	0.096	0.176
1975	8.582	0.757	8.307	8.078	10.581	0.184	0.203	0.156
1976	8.589	0.791	8.286	8.199	10.690	0.012	0.100	0.169
1977	8.704	0.747	8.437	8.378	10.765	0.064	0.128	0.157
1978	8.978	0.830	8.765	8.395	10.829	0.090	0.198	0.157
1979	9.118	0.821	8.950	8.444	10.919	0.003	0.146	0.149
1980	9.349	1.232	9.131	8.833	10.990	0.089	0.257	0.103
1981	9.388	1.525	9.095	9.178	11.058	0.187	0.213	0.092
1982	9.367	1.580	9.029	9.368	11.115	0.234	-0.156	0.109
1983	9.425	1.411	9.162	9.413	11.176	0.180	0.472	0.099
1984	9.520	0.888	9.369	9.418	11.251	0.191	0.136	0.088
1985	9.439	0.819	9.288	9.317	11.239	0.281	0.152	0.078
1986	9.255	0.495	9.124	9.078	11.251	0.387	0.152	0.107
1987	9.291	0.273	9.187	8.915	11.303	0.116	-0.054	0.123
1988	9.434	0.748	9.275	9.068	11.398	0.142	0.059	0.128
1989	9.738	1.536	9.469	9.192	11.485	0.131	-0.201	0.127
1990	9.939	1.784	9.649	9.303	11.571	0.162	0.155	0.120
1991	10.228	2.248	9.841	9.384	11.662	0.199	0.152	0.123
1992	10.290	2.346	9.846	9.754	11.747	0.228	0.469	0.123
1993	10.440	2.227	10.094	9.836	11.842	0.180	0.071	0.130
1994	10.541	1.963	10.307	9.801	11.930	0.159	0.118	0.129
1995	10.837	1.837	10.667	9.954	12.024	0.176	0.225	0.123
1996	10.988	1.942	10.812	9.961	12.119	0.201	0.204	0.097
1997	11.076	1.994	10.900	10.040	12.190	0.235	0.183	0.070
1998	10.273	1.539	10.059	9.953	12.113	0.096	-0.090	0.084
1999	10.011	2.035	9.372	10.123	12.173	0.230	-0.016	0.085
2000	10.281	1.922	9.886	10.271	12.258	0.146	0.011	0.090
2001	10.090	-0.003	10.027	10.437	12.261	0.284	0.073	0.069
2002	9.917	1.711	9.382	10.533	12.301	0.152	0.025	0.101
2003	9.914	1.400	9.536	10.564	12.353	0.154	0.023	0.102

Appendix 6: Data used in the regression analysis of aggregate output

Year	$\ln GDP_t$	$\ln PRK_t$	$\ln PUK_t$	$\ln LF_t$	$\ln PC_t$	$\ln MON_t$
1960	9.608	9.032	8.627	1.035	-2.758	-1.511
1961	9.681	9.219	8.821	1.068	-2.485	-1.439
1962	9.744	9.337	8.978	1.099	-2.429	-1.430
1963	9.815	9.442	9.113	1.130	-2.200	-1.400
1964	9.867	9.522	9.206	1.159	-2.271	-1.390
1965	9.941	9.593	9.291	1.187	-2.166	-1.384
1966	10.016	9.697	9.395	1.215	-2.101	-1.336
1967	10.054	9.765	9.457	1.241	-2.036	-1.340
1968	10.131	9.862	9.546	1.267	-1.894	-1.237
1969	10.178	9.862	9.542	1.293	-1.795	-1.204
1970	10.236	9.946	9.600	1.318	-1.649	-1.156
1971	10.292	10.084	9.670	1.355	-1.551	-1.082
1972	10.382	10.206	9.768	1.391	-1.479	-0.965
1973	10.493	10.211	9.700	1.427	-1.342	-0.970
1974	10.573	10.296	9.704	1.462	-1.326	-1.026
1975	10.581	10.458	9.881	1.497	-1.131	-0.867
1976	10.690	10.457	9.912	1.531	-1.141	-0.852
1977	10.765	10.513	10.006	1.565	-1.088	-0.842
1978	10.829	10.624	10.103	1.599	-0.955	-0.792
1979	10.919	10.699	10.148	1.633	-0.898	-0.783
1980	10.990	10.835	10.291	1.667	-0.713	-0.662
1981	11.058	11.004	10.539	1.697	-0.567	-0.582
1982	11.115	11.122	10.757	1.728	-0.781	-0.520
1983	11.176	11.209	10.915	1.759	-0.369	-0.522
1984	11.251	11.279	11.017	1.792	-0.307	-0.529
1985	11.239	11.387	11.145	1.825	-0.144	-0.448
1986	11.251	11.538	11.303	1.860	-0.004	-0.262
1987	11.303	11.543	11.295	1.895	-0.110	-0.305
1988	11.398	11.579	11.318	1.931	-0.145	-0.366
1989	11.485	11.651	11.351	1.967	-0.433	-0.347
1990	11.571	11.755	11.404	2.002	-0.365	-0.350
1991	11.662	11.894	11.461	2.029	-0.304	-0.341
1992	11.747	12.024	11.572	2.057	0.079	-0.275
1993	11.842	12.143	11.665	2.085	0.056	-0.208
1994	11.930	12.263	11.740	2.112	0.085	-0.198
1995	12.024	12.405	11.818	2.140	0.216	-0.112
1996	12.119	12.546	11.884	2.171	0.325	-0.063
1997	12.190	12.678	11.953	2.202	0.438	0.036
1998	12.113	12.641	11.961	2.231	0.424	0.046
1999	12.173	12.656	12.050	2.260	0.348	0.114
2000	12.258	12.648	12.111	2.290	0.275	0.033
2001	12.261	12.695	12.249	2.320	0.344	0.081
2002	12.301	12.665	12.320	2.348	0.328	0.059
2003	12.353	12.638	12.385	2.374	0.299	0.078

Appendix 7: Results of the unit root tests

Three unit root tests are used to assess the order of integration of the variables. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test the null of a unit root against the alternative of stationarity, while the Kwiatkowiski-Phillips-Schmidt-Shin (KPSS) tests the null of stationarity against the alternative of a unit root. As shown in the table below, the testing results are mixed. Nevertheless, it is clear that none of the variables appears to be integrated at an order higher than one, allowing legitimate use of the ARDL bounds procedure.

Table A: Unit root tests

	ADF		PP		KPSS		Conclusion
	level	1st diff.	level	1st diff.	level	1st diff.	
BC_t	-7.015***	-5.506***	-7.009***	-18.820***	0.376*	0.298	$I(0)/I(1)$
COC_t	-3.929***	-6.001***	-3.886***	-26.635***	0.547**	0.089	$I(0)/I(1)$
FD_t	-1.784	-7.454***	-1.784	-7.444***	0.217***	0.334	$I(1)$
FDI_t	-3.160	-8.491***	-3.666**	-8.579***	0.086	0.085	$I(0)/I(1)$
FL_t	-3.138	-6.741***	-3.164	-8.144***	0.140*	0.094	$I(1)$
GDP_t	-3.888**	-5.472***	-2.074	-5.440***	0.055	0.121	$I(0)/I(1)$
LF_t	-2.071	-2.332*	-1.389	-2.390*	0.110	0.157	$I(0)/I(1)$
MON_t	-2.472	-7.103***	-2.472	-7.361***	0.143*	0.193	$I(1)$
OAG_t	-0.952	-2.235*	-0.635	-4.359***	0.113	0.323	$I(0)/I(1)$
PC_t	-1.787	-7.463***	-1.787	-7.452***	0.217***	0.334	$I(1)$
PDI_t	-1.972	-5.775***	-1.723	-5.412***	0.130*	0.184	$I(1)$
PEN_t	-2.441	-5.198***	-1.851	-5.813***	0.076	0.113	$I(0)/I(1)$
$PGDP_t$	-3.405*	-5.229***	-1.996	-5.247***	0.070	0.115	$I(0)/I(1)$
PPI_t	-2.306	-6.859***	-2.573	-6.819***	0.113	0.243	$I(0)/I(1)$
PRI_t	-1.685	-4.859***	-1.137	-4.815***	0.118*	0.209	$I(1)$
PRK_t	-2.784	-4.289***	-1.082	-4.244***	0.084	0.211	$I(0)/I(1)$
PUB_t	-2.667	-8.091***	-4.392***	-7.893***	0.088	0.211	$I(0)/I(1)$
PUK_t	-2.056	-4.515***	-1.901	-4.466***	0.086	0.087	$I(0)/I(1)$
PUS_t	-3.942**	-5.431***	-3.758**	-9.367***	0.155**	0.174	$I(0)/I(1)$
PRS_t	-2.833	-7.552***	-2.811	-7.708***	0.156**	0.128	$I(1)$
RI_t	-4.342***	-4.640***	-4.280***	-17.636***	0.073	0.068	$I(0)$
UNC_t	-0.470	-2.538*	-0.759	-7.022***	0.226***	0.319	$I(0)/I(1)$
$VPRS_t$	-2.896	-7.633***	-2.863	-7.911***	0.168**	0.143	$I(1)$
YAG_t	-2.565	-2.651*	-2.336	-2.651*	0.128*	0.140	$I(1)$
$(S/Y)_t$	-0.696	-7.050***	-0.758	-9.776***	0.768***	0.114	$I(1)$
$(I/Y)_t$	-1.462	-5.552***	-1.782	-5.552***	0.153**	0.252	$I(1)$

*Notes: *, ** and *** indicate 10%, 5% and 1% level of significance, respectively. For ADF, AIC is used to select the lag length and the maximum number of lags is set to be five. For PP and KPSS, Barlett-Kernel is used as the spectral estimation method. The bandwidth is selected using the Newey-West method.*

Appendix 8: Critical values for the ARDL bounds tests

Table B: Critical value bounds for the F-test (unrestricted intercept and no trend)

k	1%		5%		10%	
	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
1	11.79	11.79	8.21	8.21	6.58	6.58
2	6.84	7.84	4.94	5.73	4.04	4.78
3	5.15	6.36	3.79	4.85	3.17	4.14
4	4.29	5.61	3.23	4.35	2.72	3.77
5	3.74	5.06	2.86	4.01	2.45	3.52
6	3.41	4.68	2.62	3.79	2.26	3.35
7	3.15	4.43	2.45	3.61	2.12	3.23
8	2.96	4.26	2.32	3.50	2.03	3.13

Table C: Critical value bounds for the t-test (unrestricted intercept and no trend)

k	1%		5%		10%	
	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
1	-3.43	-3.43	-2.86	-2.86	-2.57	-2.57
2	-3.43	-3.82	-2.86	-3.22	-2.57	-2.91
3	-3.43	-4.10	-2.86	-3.53	-2.57	-3.21
4	-3.43	-4.37	-2.86	-3.78	-2.57	-3.46
5	-3.43	-4.60	-2.86	-3.99	-2.57	-3.66
6	-3.43	-4.79	-2.86	-4.19	-2.57	-3.86
7	-3.43	-4.99	-2.86	-4.38	-2.57	-4.04
8	-3.43	-5.19	-2.86	-4.57	-2.57	-4.23

Notes: k = number of variables. If the test statistics exceed their respective upper critical values, the null is rejected and it can be concluded a long-run relationship exists. If the test statistics fall below the lower critical values, the null hypothesis of no cointegration cannot be rejected. If the statistics fall within the band, the statistical inference would be inconclusive.
Source: Pesaran, Shin and Smith (2001).

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